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Working Paper

MANPRINT FINDINGS FROM THE OT II TEST OF THE
REMOTELY PILOTED VEHICLE SYSTEM (AQUILA)
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APPENDIX B

MANPRINT ASSESSMENT

1.0 OVERVIEW

1.1 The test design plan emphasized the three MANPRINT areas of human factors engineering, safety, and health hazards as part of issue 4. Other MANPRINT areas were assessed as part of a thorough investigation and included training, manpower, and organizational structure. The purpose of the assessment was to investigate the MANPRINT areas in order to identify MANPRINT findings leading to system refinements. The assessment was conducted in support of USAOTEA by the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) Fort Hood Field Unit.

1.2 Table 1.2.1 lists the major MANPRINT findings and the locations of the findings within the appendix. Table 1.2.2 lists the major sections of the appendix and the associated page numbers.

1.3 Several types of data collection techniques were used in order to gather MANPRINT data. Data collection techniques included critical task crew performance measures, critical task assessment interviews, on-site observation, structured interviews covering test data requirements, and comment and opinion data from test participants. The use of multiple data collection techniques provided the avenues of investigation into the broad MANPRINT areas to ensure a full analysis.

2.0 METHODOLOGY

2.1 Twenty-five critical tasks were examined throughout the conduct of OT II and are listed in Table 2.1. Timed crew performance measures were collected on 20 of the critical tasks amenable to timed data collection under the conditions and restraints of operational testing. One critical task, to perform an emergency hydraulic slave of the recovery vehicle, was performed as an end-of-test demonstration.

2.2 Stringent criteria were applied to the selection of potential critical crew performance tasks. The purpose of applying a stringent criteria was to narrow the focus of the assessment to those tasks that were essential for the success of the RPV battery's mission. However, as hardware and software modifications impact on operating procedures, critical tasks change in importance during the evolution of a system's design . Moreover, the criticality of some tasks can be masked by the necessary on-site presence of the manufacturer's representatives supporting testing prior to OT II. Therefore, the assessment focused on tasks that were likely to be critical under operational conditions. The criteria for selection of the essential critical crew tasks included:

a. Unsuccessful performance of the task would result in a failure to complete a mission.

Table 1.2.1. Major MANPRINT Findings and Location of Supporting Information

Description of Major Finding	Supporting Information Section	Supporting Information Tasks
CRITICAL TASKS		
1. The critical task procedures of prelaunch operations required excessive time to complete. Test and checkout procedures conducted during prelaunch operations interrupt the launch process and could be conducted prior to launcher emplacement. The critical task of preparing, entering, and verifying a mission plan may also delay launch operations.	4.1 4.2 7.0	Prelaunch Operations
2. The critical task operate mission payload system in track mode for Copperhead involves skills and techniques requiring training refinements including crewman anticipation of target motion, direction, and rate of travel. Crewmen also would benefit from techniques for establishing the orientation of the AV and payload when both are in motion. The location of the payload control joystick and laser lock button interfere with right-handed use of the controls.	4.12 7.0	Artillery Mission & Target Detection
3. Several unsafe conditions existed during the critical tasks of transferring the AV from the AVH to the launcher. Walking surfaces on the launcher were restricted and slippery when wet. Crewmen frequently jumped from vehicle to vehicle. A potential fire hazard existed when vehicles were parked next to each other in opposite directions. The AVH muffler pipe exhaust was directed at spilled fuel on the AV and launcher rail. Cable slings for the AVH crane were often frayed and breakage could result in equipment damage or injury.	4.8 7.0	AV from Container to Stand & AV from Stand to LV
4. The critical task timed measures for remove the recovery net and shutdown the recovery subsystem indicated the need for procedural refinements in order to increase system survivability. The current procedures leave the recovery vehicle, with its high profile visual signature, emplaced and exposed for almost one hour.	4.17 7.0	Stow Recovery Subsystem

Table 1.2.1. Major MANPRINT Findings and Location of Supporting Information (Cont'd)

Description of Major Finding	Supporting Information Section	Supporting Information Tasks
5. The critical task of fueling and defueling the AV involved 27 recorded RAM incidents during the test. Numerous problems with the service pump and AV fuel bladder indicate a need for hardware refinement. The potential for inoperable fuel service pumps during combat increases the probability of delays or postponements of battery operations.	4.18 7.0	 Defuel AV
TRAINING, MANPOWER, AND PERSONNEL		
1. Major MANPRINT findings for which refinement will bring the greatest system improvement involved training. Operators' training was sufficient for the general use and operation of RPV equipment. Operator training was deficient for special skills and Army operational requirements. Major training deficiencies included:		
a. Skill requirements:		
(1) Techniques for identifying target features or cues at realistic combat ranges and "down look angles."	5.0	
(2) Techniques for identifying appropriate intelligence information and conducting procedures for reporting the information (SALUTE reports).	5.0 7.0	 Artillery Mission
(3) Techniques for detecting targets concealed in vegetation, shadows, or tactical positions.	5.0	
(4) Techniques for optimum mission flight planning search strategies based on realistic air/land battlefield scenarios to include: maintaining flight orientation, direction of flight, direction flown, and milestone terrain features.	5.0 7.0	 Target Identification

Table 1.2.1. Major MANPRINT Findings and Location of Supporting Information (Cont'd)

Description of Major Finding	Supporting Information Section	Supporting Information Tasks
(5) Techniques for determining moving target direction and speed, and for coordinating the COPPERHEAD missions with the artillery battery.	4.12 5.0	
(6) Techniques for use of display brightness and contrast controls to optimize video imagery during adverse conditions (i.e., low light, glare, terrain features having high contract).	4.12 5.0	
(7) Techniques for emplacement of the GCS to facilitate antenna signal propagation.	4.3.4	
(8) Tactical emplacement of the RPV battery to facilitate cover and concealment using natural terrain features, rapid displacement for march, hasty evacuation, and perimeter security.	4.3 5.0 6.0 7.0	Artillery Mission
b. Operational requirements. Battery commanders, mission commanders, air vehicle operators and payload operators should have increased knowledge of:		
(1) RPV battery integration with TOC FDC and artillery battery operations.	5.0 6.0 7.0	Artillery Mission
(2) Operating procedures for forward observers.		
(3) Intelligence-gathering operations and procedures.		

Table 1.2.1. Major MANPRINT Findings and Location of Supporting Information (Cont'd)

Description of Major Finding	Supporting Information Section	Supporting Information Tasks
(4) Air/land battlefield tactics and doctrine to include the order of battle, supported unit commander's intent, and relationships among threat targets.		
(5) Communications net components, discipline, and procedures to include the interface with multiple subscriber equipment (MSE).	7.0	Artillery Mission
2. The use and role of the Battery Operations Center (BOC) and battery commander needed to be refined. The BOC and battery commander were under-utilized during testing as most communications and operational decisions were made by GCS personnel.	5.0 7.0	 Target Identification & Artillery Mission
3. Manpower was insufficient for 24-hour operations, perimeter security, site traffic control, or for recovery of downed AVs. Manpower savings might be realized by redesign of the RGT trailer to require only a two-man advance party and refining the role of the battery commander rather than to use four-man crews in the GCS. MPO, AVO, and MC stress and fatigue were controlled by frequent rotation of GCS crewmen.	4.3 4.8 7.0	 Other, MANPRINT Primary = Manpower and Personnel
HUMAN FACTORS ENGINEERING		
1. The air vehicle operators (AVO), mission payload operators (MPO), and mission commanders (MC) consoles require refinements. The GDT panel with its critical link status indicators are located above AVO's head and are difficult to view while other tasks are conducted. The payload joystick and laser lock controls are difficult for right-handed MPOs to use. The MC console was not used as designed and was used as a communications control device when four-man crews operated the GCS. The mission commander stood behind the MPO and AVO viewing their displays. There is a lack of audio warning signals at the consoles to supplement critical visual warning indicators.	4.9 4.10 4.12 7.0	 Prelaunch Operations & Other, MANPRINT Primary = Crewstation Design

Table 1.2.2. Appendix B Major Section Titles, Section Nos. and Page Nos.

Section Title	Section No.	Page No.
Overview	1.0	B-1
Methodology	2.0	B-1
Organization of the Findings	3.0	B-11
Critical Task Assessment	4.0	B-15
Prelaunch Operations	4.1	B-15
Prepare, Enter, and Verify AV Mission Plan	4.2	B-23
Emplacement of RPV Components	4.3	B-35
Install/Stow Fiber Optics Cables	4.4	B-66
Locate and Align RGT	4.5	B-77
Power Up GCS	4.6	B-79
Prepare Recovery Subsystem for Recovery and Deploy Recovery Subsystem Barrier Support Structure	4.7	B-81
Remove AV from Container to AV Support Stand and Move AV from Support Stand to Launch Subsystem	4.8	B-93
Perform Launch Operation of AV	4.9	B-105
Perform Handoff	4.10	B-111
Position AV on Gun Target Line	4.11	B-117
Operate Mission Payload System in Track Mode for Copperhead	4.12	B-118
Perform Artillery Adjust Mission	4.13	B-127
Perform Damage Assessment	4.14	B-132
Lost Link Reacquisition	4.15	B-136
Perform AV Recovery	4.16	B-141
Remove Recovery Net and Shutdown Recovery Subsystem	4.17	B-145
Fueling and Defueling AV	4.18	B-153
Perform Emergency Hydraulic Slave for Recovery Launch Subsystem	4.19	B-157
Critical Task Review of MOPP Conditions	4.20	B-160
Training, Manpower, and Organizational Considerations	5.0	B-162
Maintainability Review	6.0	B-182
Test Participants' Comments and Opinions	7.0	B-205
Structured Interview Findings	8.0	B-266

Table 2.1. Critical Tasks of the Critical Task Assessment (CTA)

Sequence Number	CTA Number	Task Title
1	CTA0012	Emplacement of GCS
2	CTA0009	Emplacement of launch subsystem
3	CTA0011	Emplacement of recovery subsystem
4	CTA0010	Emplacement of remote ground terminal (RGT)
5	CTA0083	Install/stow fiber optics cables
6	CTA0004	Locate and align RGT*
7	CTA0074	Power up GCS*
8	CTA0096	Prepare recovery subsystem for recovery
9	CTA0100	Deploy recovery subsystem barrier support structure
10	CTA0102	Remove AV from container to AV support stand
11	CTA0016	Move AV from support stand to launch subsystem
12	CTA0025	Prelaunch operations
13	CTA0031	Prepare, enter, and verify AV mission plan
14	CTA0040	Perform launch operation of AV
15	CTA0037	Perform handoff
16	CTA0055	Position AV on gun target line*
17	CTA0054	Operate mission payload system in track mode for Copperhead
18	CTA0051	Perform artillery adjust-conventional munitions
19	CTA0052	Perform damage assessment
20	CTA0039	Lost link reacquisition
21	CTA0049	Perform AV recovery
22	CTA0066	Remove recovery net
23	CTA0067	Shutdown recovery subsystem
24	CTA0027	Fueling and defueling AV*
25	CTA0101	Perform emergency hydraulic slave for recovery launch subsystem

*Constraints encountered during testing prevented timed measures from being collected for the tasks.

b. Unsuccessful performance of the task would have severe impact on system performance or result in a failure of the system.

c. Improper performance of the task would constitute, or lead to, a safety or health hazard.

d. Improper performance of the task would lead to equipment failure.

2.3 Critical tasks were distinguished from other tasks in that unsuccessful performance of the task was estimated to have the highest probability of affecting the success of the mission. Moreover, practical consideration was given to the number of critical tasks selected and to the requirements imposed on the data base and data collection resources.

2.4 The validity of the selected performance measures was established using several techniques. Techniques included:

a. Reviews of current training and technical manual documentation. CTA numbers for the critical tasks correspond to the OPR numbers for the TRADOC task descriptions.

b. Observations of RPV operations during developmental testing at Fort Huachuca, AZ.

c. Observations of training FTX at Fort Sill, OK.

d. Discussions with key training instructors at Fort Sill.

e. Reviews with the USAOTEA MANPRINT POC and Test Directorate personnel.

f. Reviews, prior to record test data collection, with MANPRINT Data Authentication Group (DAG) members of organizations participating in the test.

g. Interviews conducted with battery personnel during conduct of the test concerning the critical tasks. The interviews were based on the most current procedural listings of task steps available in the technical documentation.

2.5 The reliability of the timed measures was estimated using two statistical techniques. First, split-half correlations were computed for each of the measures based on the repeated time measures of a task. Scores adjacent in time were paired, and the correlation between the pairs was computed. The correlations would be expected to be greater than zero to the extent that adjacent scores were more similar than distant ones. The correlations should have provided the lower bound estimates of reliabilities. Second, the sums of squares for each critical task was examined as a rough estimate of reliability. The sums of squares provide an estimate of the variance accounted for that was non-random reliable variance. Moreover, reliability of the data was assured by the thorough screening of the data given by

the MANPRINT DAG. Numerous suspect scores were identified, investigated, and if erroneous, corrected. The split half reliability coefficients found for the data indicated that high level statistical treatment of the data (t test, F test, R^2, etc.) would be inappropriate for the data. Moreover, operational test conditions do not meet the assumptions necessary for the analysis of variance.

2.6 Virtually all tasks performed by the RPV battery were performed by teams of crewmen. The task procedural steps were performed in a parallel fashion among teams of crewmen rather than in a serial fashion amenable to individual performance measurement. Moreover, the effects of the high degree of interaction among the crewmen, which contributes to their task success or failure, is extremely difficult or impossible to assess. Therefore, crew performance measures were best suited to the constraints of operational testing.

2.7 Development of the Critical Task Analysis (CTA) data base for the timed measures occurred as an ongoing effort as part of the development of the test data base. Worksheets were prepared for each critical task and contained the purpose of the measure, the desired data elements, the data element operational definition, and a description of the planned analysis. The test data manager then began the process of integrating the critical task measures into the test data base and data collection requirements. Computer specification worksheets were prepared and contained descriptions of the data elements, data display matrices for DAG review, program format and output requirements, and examples of graphic displays. Data collection forms and materials were then prepared incorporating the critical task measures into the forms to be used for system performance and RAM data collection.

2.8 Interviews were conducted with battery crewmen concerning the procedural steps involved in each critical task. Procedures from the most current of the technical manuals were listed and used as discussion guides. The discussions lasted from 10 to 30 minutes and were conducted on-site at vehicle emplacement locations. The interviews focused on task procedures, critical procedural efficiencies or errors, and the training of tasks.

2.9 Data were analyzed using the Statistical Analysis System (SAS). Programs used to investigate the critical task timed data included:

a. PROC MEANS
b. PROC GLM
c. PROC UNIVARIATE
d. PROC SPLOT
e. PROC PLOT
f. PROC CORR

2.10 The MANPRINT assessment conducted during OT II was an exploratory assessment. Only the statistical information contributing to an understanding of the findings was displayed rather than inundating the report with all the statistical output available in SAS programs. The methods and statistics used in the MANPRINT assessment are those

that are generally accepted for use in exploratory research.[1] Data files were examined by members of the MANPRINT DAG. The MANPRINT DAG investigated 457 data anomalies and identified zero entries, duplicate entries, and other numbers affecting a meaningful analysis of the data. Since the purpose of the CTA analysis was to better understand crew tasks, the data files used for analysis were adjusted to include:

a. Extreme outliers were reviewed in data displays for MANPRINT team and DAG review. However, the extreme outliers were deleted from data files used for analysis with the exception of the univariate descriptive statistics. The median, when available in selected SAS products, was considered a better measure of central tendency than the mean for reporting purposes in view of the type of skewed distributions typical of operational test data.

b. Missing data were investigated and the appropriate data were added to the data files if the data were available from the raw data forms. There were several appropriate causes for missing data, such as partially completed but cancelled missions resulting in missing values for tasks that would have normally occurred after the cancellation. Verified missing data values were deleted from the data files for analysis.

c. Duplicate entries, generally caused from repeated launch attempts but affecting several of the critical tasks, were deleted from the data files for analysis with the exception of the first entry.

2.10.1 The number of events or occurrences of activities for critical tasks, such as launch aborts, will not equal the total numbers of the events during OT II as a result of the occasional deletions of outliers and duplicate entries. Trials involving mission operational protective posture (MOPP) IV accounted for only five percent of the trials. Separate analyses of MOPP and non-MOPP trials were conducted for each task. However, no meaningful patterns or differences were found. MOPP trials were included in the overall analyses. The battery generally did not operate during foul weather. However, ground conditions were considered for emplacement tasks.

2.11 The findings of the MANPRINT CTA can be used for several purposes, including:

a. Examining the impact of crewman performance on system performance.

b. Examining the impact of equipment design and operating procedures on crewman performance.

c. Developing or refining technical manuals, training, POI materials, and ARTEP standards.

[1]Tukey, J. W. Exploratory data analysis. Reading, MA: Addison Wesley, 1977.

2.12 Structured interviews were developed using a Yes/No checklist format with space to record interviewee comments. The checklists were used to guide the interviewers and also to allow the interviewees to make any comments they desired. A separate interview was designed for test data collectors; ground control station: launch, recovery, and AV handler; maintenance; and supporting unit test participants. The interviews were designed to investigate key data requirements related to MANPRINT areas of concern. The interviews were administered to battery personnel at the battery site, and to supporting unit personnel in classrooms. The structured interviews were administered in the last two weeks of Phase IIIB, after participants had experienced the majority of the test.

2.13 Comment and opinion data were collected throughout the test from all test participants. Comment and opinion data collection forms and a coding taxonomy for the comments were developed. To allow rapid sorting and display of the comment data, the comments and opinions were coded for four major categories, including MANPRINT area, RPV/Artillery system component, mission phase, and critical task. Comments and opinions were collected at the battery site.

2.14 On-site observations of battery operations were made by MANPRINT researchers throughout the test. The observations were used to develop an understanding of findings emerging from the data base. Information gained through direct observation was used to provide detailed explanations supporting other sources of numerical data.

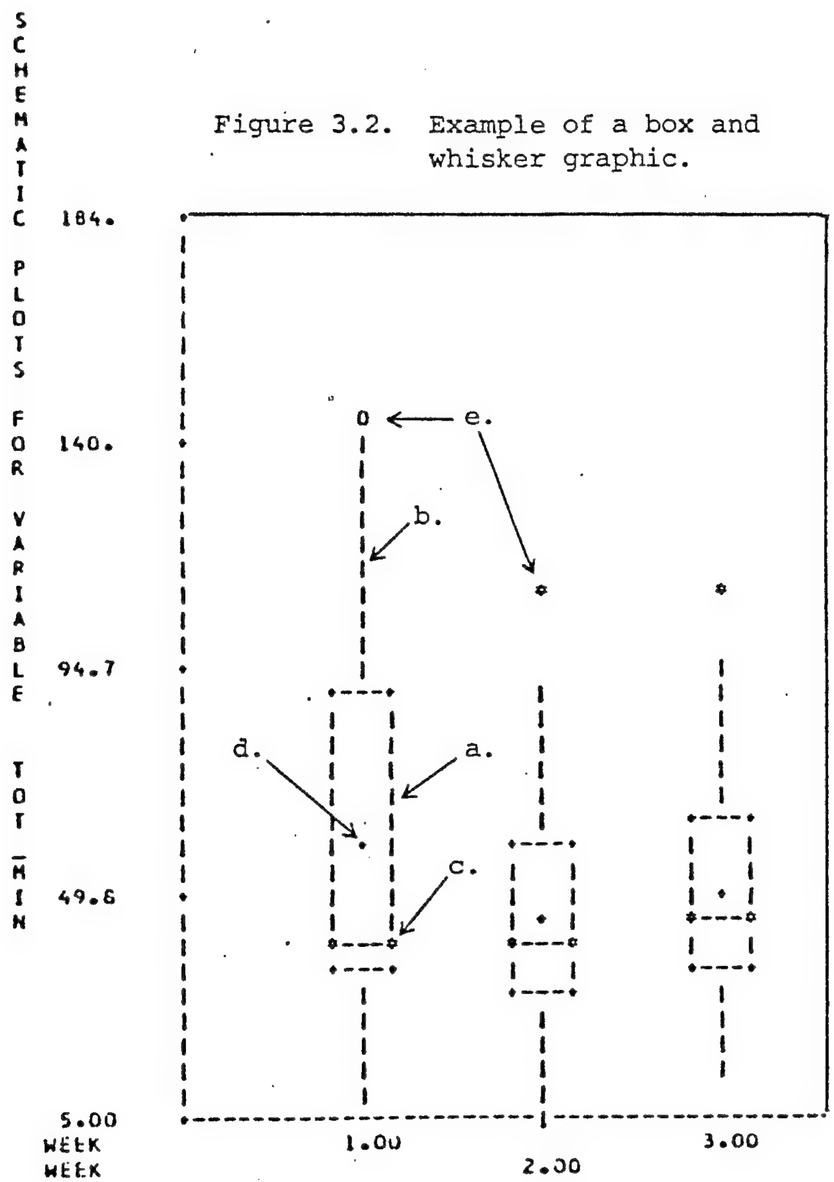
3.0 ORGANIZATION OF THE FINDINGS

3.1 The MANPRINT findings were organized into five sections. The first three sections addressed MANPRINT concerns, while the last two sections contained data addressing specific data requirements. The findings were presented using data displays, tables, and lists in order to facilitate review of the large quantity of information resulting from the MANPRINT assessment.

3.2 The critical task assessment was organized using a similar format for each critical task. A brief overview of major statistical findings for the task was presented followed by data displays and specific findings for each of the applicable MANPRINT areas. A variety of statistical outputs from SAS programs were examined for each critical task. The statistical output that contributed to understanding the critical task was selected. Figure 3.2 shows an example of a SAS PROC SPLOT box and whisker graphic for a critical task. The PROC SPLOT graphic was a very useful tool for understanding the nature of the task data. The graphic display of this type was used frequently and included the following information:

a. Box (a) and whisker plots for each week of the test. The limits of each box are the first (lower edge) and third (upper edge) quartiles of each week's data distribution. The vertical length of the box shows the middle fifty percent of the data distribution. The length of the box indicates the variability of the data.

Figure 3.2. Example of a box and whisker graphic.



b. The whiskers. The whiskers indicate the tails of the data distribution. The lower whiskers indicate the ranges of data comprising the 1st to the 25th percentiles. The upper whiskers indicate the ranges of data comprising the 76th to the 100th percentiles.

c. The median. The median is indicated by asterisks (*) joined by a dashed line.

d. The mean. The mean is indicated by a plus sign (+).

e. Extreme outliers. Extreme outlying values are indicated by zeros (o, values that might occur once in twenty times in a normal distribution). and by asterisks (*, values that might occur once in two hundred times in a normal distribution).

3.3 The critical task assessment findings begin with the critical tasks 12_CTA0025 Prelaunch operations and 13_CTA0031 Prepare, enter, and verify AV mission plan, due to the significance the tasks have for system performance. The other tasks follow in the sequence order indicated in Table 3.3, which is a summary of basic statistics for each critical task.

Table 3.3. Summary of CTA Timed Data

CTA Title	CTA Number	First Quartile	Median	Third Quartile	Number of Trials	Mean	Standard Deviation	Coefficient of Variation	Split Half	Sum of Squares
Emplacement of GCS	0012	16.8	23.8	39.7	76	29.7	13.1	60.9	.23 .06	.23
Emplacement of launch subsystem	0009	4.4	6.4	10.6	77	8.7	7.7	88.8	-.06 .28	.30
Emplacement of recovery subsystem	0011	1.1	2.2	3.0	80	2.3	1.4	61.0	.01 -.24	.27
Emplacement of RGT	0010	30.0	43.0	60.0	63	47.2	20.7	43.8	.32 .43	.46
Install/stow fiber optics cables	0083									
Install		13.5	17.8	25.4	50	32.3	30.5	94.4	-.13 .00	.30
Stow		7.7	27.9	44.5	64	19.2	9.1	47.4	.18 -.19	.29
Prepare recovery subsystem	0096	16.0	27.8	47.0	80	39.6	34.2	86.3	.05 -.06	.29
Deploy recovery subsystem	0100	5.5	7.3	10.5	81	8.8	5.6	63.4	.29 -.10	.17
Remove AV from container	0102	2.4	5.6	10.0	120	8.0	8.3	104.1	.04 .10	.24
Move AV launcher	0016	4.1	5.2	6.6	103	5.9	2.8	47.4	.17 .08	.30
Prelaunch operations	0025	33.7	47.5	102.6	79	72.5	57.9	79.9	.26 -.02	.25
Enter and verify AV mission	0031	5.0	11.1	21.4	185	14.8	13.8	93.3	.08 -.21	.28
No stored flight plan		13.8	21.1	32.8	29	26.7	18.7	70.0		
Stored flight plan		4.6	10.0	18.8	156	12.6	11.5	91.3		
Prepare plan		11.1	32.6	59.7	182	33.2	145.8	43.9	-.01 .23	.39
Perform launch operation of AV	0040	7.5	9.5	9.9	226	8.9	1.6	18.3	.31 .39	.27
Perform handoff	0037	1.5	1.8	2.4	127	2.1	.9	46.1	.33 .35	.46
Operate payload for Copperhead	0054 Laser break n = 4									
Perform artillery adjust	0051	1.0	1.5	2.0	113	1.8	1.1	61.8	.10 .16	.20
Perform damage assessment	0052	.02	.33	1.06	24	4.8	4.8	100.4	.73 -.03	.99
Lost link reacquisition	0039	.6	5.6	8.0	21	5.5	4.8	86.9	.12 -.50	
Perform AV recovery	0049	28.1	40.8	62.3	79	52.2	36.4	69.8	.06 .41	.36
Remove recovery net	0066	1.4	2.2	7.4	81	5.2	6.3	122.7	.16 .19	.56
Shut down recovery subsystem	0067	10.3	13.2	17.5	78	14.5	7.5	51.3	.15 .01	.18
Perform emergency hydraulic slave for recovery launch subsystem	0101	one trial, 59 min. before pump failure								

4.0 CRITICAL TASK ASSESSMENT

4.1 12_CTA0025 Prelaunch operations.

4.1.1 The first criteria for Issue 1, flight operations, stated "(a) When the RPV section arrives at a surveyed position and a mission request is received, the RPV section must be able to plan, coordinate, and effect launch of an AV within 1 hour in daylight or within 1.5 hours in darkness after site emplacement or after receipt of mission request, whichever is later. Eighty percent of these trials must be successful." Explanations for the RPV section's partial success in meeting the criteria may be found in two critical tasks conducted in different battery locations during the time specified in the criteria. The critical tasks are 12_CTA0025 Prelaunch operations, conducted by launcher crews, and 13_CTA0031 Prepare, enter, and verify AV mission plan, conducted by GCS crews.

4.1.2 Findings for 12_CTA0025 Prelaunch operations indicated that excessive time was taken by crews performing the task. The procedures performed during this task involved test and verification of the AV, launcher hydraulics, and MICNS data. Any fault or error detected in system components at this critical stage stopped or slowed the entire launch process. Efficiency of prelaunch operations could be improved by:

a. Improving maintenance shelter fault isolation test equipment for the AV. Ensuring that an AV is ready for flight and launch prior to its delivery to the launcher.

b. Transmitting MICNS data electronically and directly to the launcher MICNS initializer from the GCS. Eliminate the need for launcher crewmen to hear and enter data at the launcher. Ensure the MICNS data verification procedures used at the GCS are appropriate.

c. Verify the working order of the launcher hydraulic system while the launcher is in the hide position before its emplacement for launch. Crews were observed placing the AV on the launcher while the launcher was in hide. Verify AV and launcher readiness at that time.

4.1.3 Data and information supporting the prelaunch operations critical task findings of crew performance included:

a. Procedural references:

DEP 55-1550-200-CL-5 pages N-6 through N-7
TM 55-1550-200-10

b. The timed measure began when GCS instructed LV to begin prelaunch operations. The timed measure ended when AV ready light was green and GCS commanded to start launch sequence.

c. Table 4.1.3.1 lists the descriptive statistics for the prelaunch critical task. The overall time was close to the time specified in the system criteria of 60 minutes (Median = 49.5; Mean = 72.51).

d. Task times for the three critical tasks, within the 60-minute system performance criteria, included: (1) 2_CTA0009 Emplacement of launch subsystem (Median = 8.72), (2) 12_CTA0025 Prelaunch operations (Median = 49.5); and (3) 14_CTA0040 Perform launch operation of AV (Median = 9.5) total 67.7 minutes. This clearly shows that in order to meet the system criteria, the greatest gains can be made by lessening the time required to perform prelaunch BIT/BITE and system checkouts.

e. Table 4.1.3.2 lists the descriptive statistics for each week of the test. Times exceed the system criteria of 60 minutes (high means range from 76.8 to 170.41). However, maximum values include outlying values for review purposes.

f. Figure 4.1.3.1 shows the box and whisker plots for each week of the test. The length of the boxes indicates high variability with boxes extending as high as 140 minutes to complete prelaunch operations. Eighty-three prelaunch operation trials were analyzed; 35 trials exceeded 60 minutes and 27 trials ranged from 30 to 60 minutes. A partial explanation for the length of the box plots beginning with week six may be due to the increase in AV RAM incidents during the corresponding periods which were detected during prelaunch operations.

g. Figure 4.1.3.2 shows box and whisker plots of first, middle, and last trails of the day. First trials of the day are likely to be more representative of potential tactical conditions. First trials of the day were found to be longer than later trails (Mean first trial = 96.3 minutes, N=33; Mean middle trial = 58.8 minutes, N=27; Mean last trial = 50.7 minutes, N=19). The first trials of the day were often conducted under early morning low light conditions. The mean for prelaunch operations for first trials (Mean = 96.31 minutes) exceeded the system criteria for launch of 90 minutes in darkness.

Table 4.1.3.1. Overall Descriptive Statistics

12_CTA0025 FROM 87018 TO 87087
PRELAUNCH OPERATIONS

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	79	SUM WGTS	79
MEAN	72.5188	SUM	5728.98
STD DEV	57.9228	VARIANCE	3355.05
SKEWNESS	1.37308	KURTOSIS	1.64494
USS	677153	CSS	261694
CV	79.8728	STD MEAN	6.51683
T:MEAN=0	11.1279	PROB>|T|	0.0001
SGN RANK	1580	PROB>|S|	0.0001
NUM ¬= 0	79		
D:NORMAL	0.169131	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	273.15	99%	273.15
75% Q3	102.65	95%	209.616
50% MED	49.4833	90%	149.05
25% Q1	33.6833	10%	15.2167
0% MIN	5.81667	5%	10
		1%	5.81667
RANGE	267.333		
Q3-Q1	68.9667		
MODE	5.81667		

EXTREMES

LOWEST	HIGHEST
5.81667	181.3
5.95	209.617
7.05	222.667
10	234.583
11.3333	273.15

Table 4.1.3.2. Descriptive Statistics by Week of Test

12_CTA0025 FROM 87018 TO 87087
PRELAUNCH OPERATIONS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	13	89.44	114.39	11.33	443.60	31.73	1162.72	13084.83	127.89
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	46.50	29.96	7.05	110.25	8.31	604.48	897.63	64.43
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	52.07	33.52	15.35	112.07	13.69	312.42	1123.89	64.38
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	82.26	84.52	10.00	222.67	34.51	493.55	7143.74	102.75
WEEK=WK5: 15-21 FEB									
TOT_MIN	4	113.17	153.47	17.72	342.47	76.74	452.67	23554.48	135.62
WEEK=WK6: 22-28 FEB									
TOT_MIN	3	76.87	43.36	27.85	110.22	25.04	230.62	1880.41	56.41
WEEK=WK7: 1-7 MAR									
TOT_MIN	18	90.40	65.32	5.82	209.62	15.40	1627.27	4266.44	72.25
WEEK=WK8: 8-14 MAR									
TOT_MIN	9	170.41	161.91	31.63	499.88	53.97	1533.65	26214.05	95.01
WEEK=WK9: 15-21 MAR									
TOT_MIN	11	83.45	59.13	22.67	234.58	17.83	917.92	3495.86	70.85

Figure 4.1.3.1. Prelaunch operations: Box and whisker plots for each week of the test.

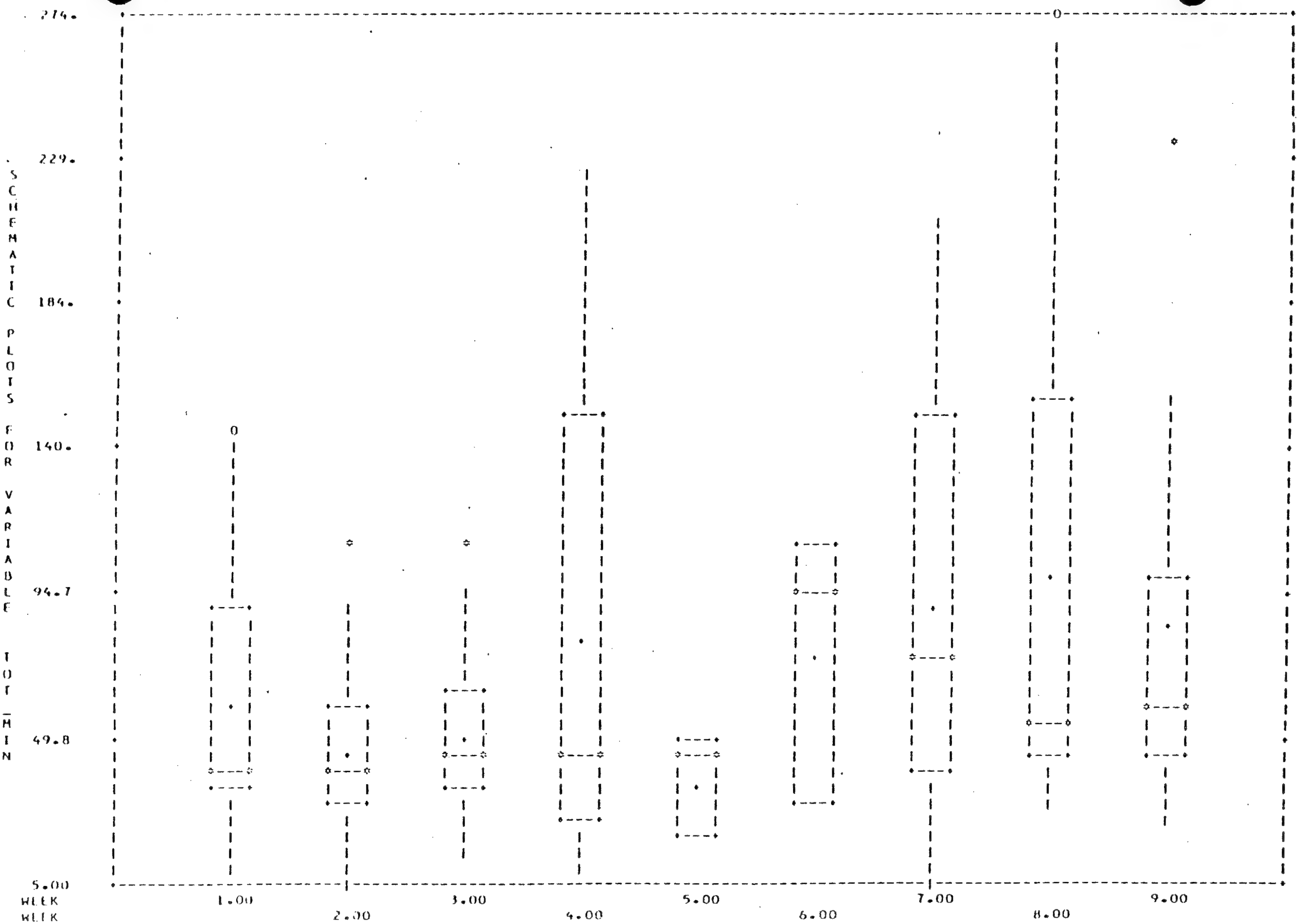
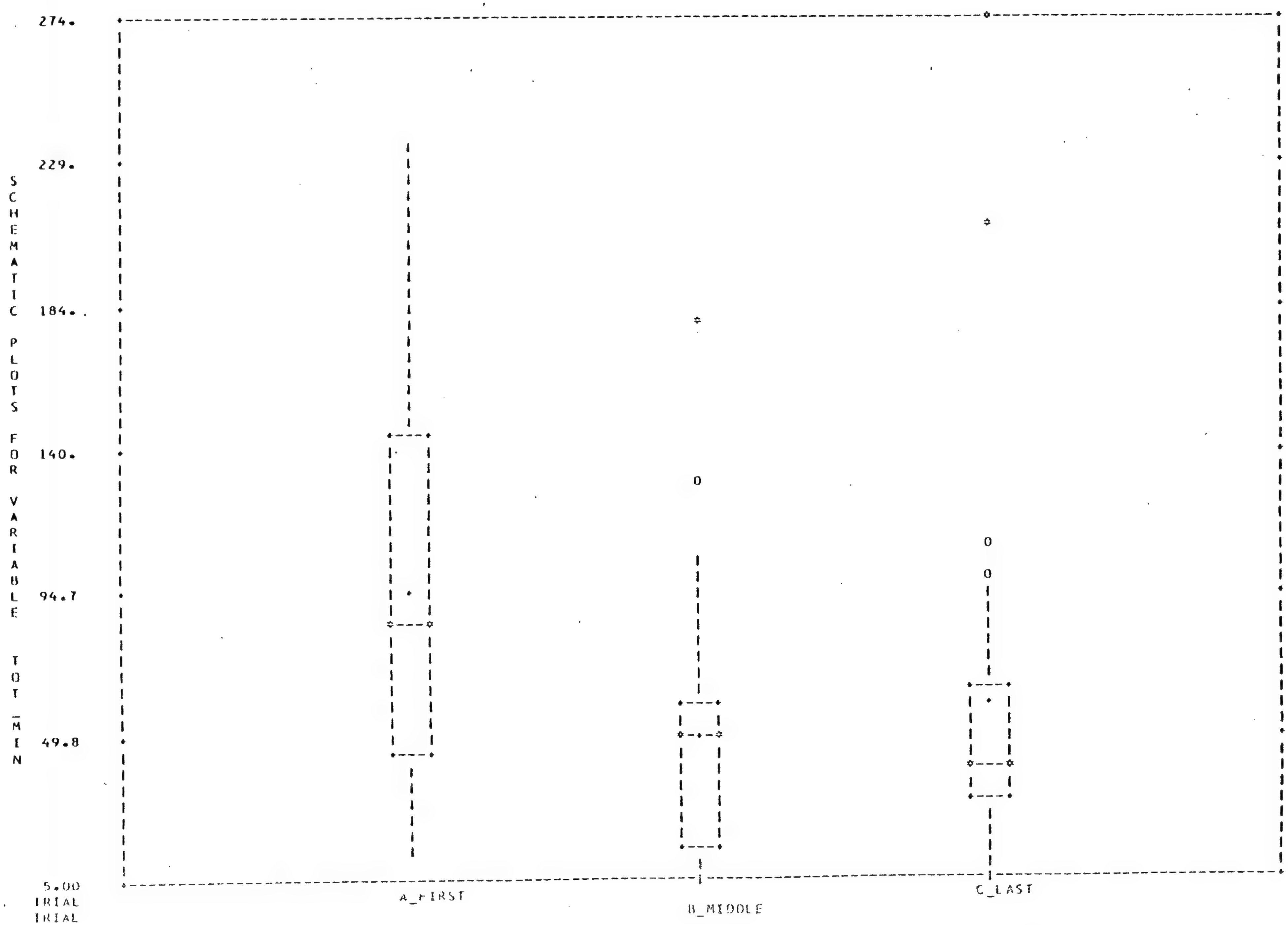


Figure 4.1.3.2. Prelaunch operations: Box and whisker plots for first, middle, and last trials of the day.



4.1.4 Factors affecting 12_CTA0025 Prelaunch operations:

A. Procedural Considerations

Note: The prelaunch operations would require approximately 10 minutes to complete with only slight variations in time when all AV, LV, and GCS systems are working appropriately.

1. The launcher and prelaunch tasks have become the focus of system testing. All testing and correction of faults become time consuming. Test functions should be distributed to other system components so that all launch functions are "ready to fly" prior to launcher emplacement.

2. . One mission commander reported a preference for launching the same AV every time it was available rather than rotating AVs because his experience was that often AVs returned from maintenance were not repaired or ready to fly.

B. Potential Errors

1. Errors in initializing the MICNS have been made when wrong codes have been entered at the launcher. It is believed that noise or the poor quality of the transmission over the landline interfered with the communications resulting in hearing the codes incorrectly. Several communications errors were reported and communications were judged to be especially difficult after AV engine was started. Noise levels during launch sequence ranged from 123 dB at 0 M to 109 dB at 10 M behind the LV.

2. Failure to set the AV weight setting switch could result in a failed launch. Air vehicles must be reweighed and stamped after air frame repair, as repairs have been known to increase their weight.

C. Training Implications

1. Verification procedures and a paramount need for verifying GCS/launcher communications should be stressed.

2. Safety procedures during malfunction diagnosis and maintenance need to be stressed to prevent injuries.

3. Crewmen without hearing protection were observed standing close to the LV.

D. Human Engineering Considerations

1. The communications equipment at the launcher does not appear to be suitable for use in a high noise environment.

2. The MICNS is difficult to initialize during periods of darkness. It is very difficult to read the data as recorded on the data sheet, see where to record the new data or to read labeled displays.

3. Workspace on the LV platform is inadequate. Soldiers must perform their duties in strained and unusual postural positions. Their feet are often positioned at the extreme edges of the work platform, making the crewmen susceptible to fall injuries.

E. Safety/Health Hazard

Noise levels behind the LV during launch were measured and include:

Distance from rear of LV	Decibel (dB) scale A	B	C
0 M	120	119	123
5 M	108	108	109
10 M	107	107	109

Height of sensor was 1.7 M.

The duration of exposure was short (average 2:48 minutes). Some crewmen did not wear hearing protection when standing close to the LV. The use of hearing protection should be stressed.

4.2 13_CTA0031 Prepare, enter, and verify AV mission plan.

4.2.1 Critical task 13_CTA0031 Prepare, enter, and verify AV mission plan were tasks conducted in the GCS by the mission commander (MC) and air vehicle operator (AVO). The tasks were conducted parallel to the emplacement task for the launcher. Once the mission plan launch data was prepared, the appropriate data was transmitted by voice over landline to the launcher crew for input into the MICNS initializer. Launch of the AV was, in part, dependent on the preparation of the mission flight plan.

4.2.2 The rapid and correct preparation of the flight plan did impact on the flight operations criteria briefly stated again to "effect launch of the AV within 1 hour in daylight or 1.5 hours in darkness after site emplacement or receipt of the mission order." Findings for 13_CTA0031 Prepare, enter, and verify AV mission plan indicated that excessive time was used in completing the tasks. Efficiency of flight plan preparation, entry, and verification could be improved by:

a. Improving software that: reduces the need for calculations, prompts the operator, contains reference tables and codes, provides rapid verification of items such as MIM codes.

b. Transmitting MICNS data electronically and directly to the launcher MICNS initializer. Eliminate the need for GCS personnel to read and verbally transmit the data to the launcher.

4.2.3 Data and information supporting the critical task of preparing and entering a mission flight plan included:

a. Procedural reference:

DEP 55-1550-200-CL-2 pages N-1 through N-4
TM 55-1550-200-10

b. The timed measure for preparation of a mission flight plan began when the GCS MPO or AVO began to prepare the worksheets. The timed measure ended when the first key was struck to enter the flight plan. The timed measure for entering and verifying a flight plan began when the first key was struck to enter the plan. The timed measure ended when the last key of the last entry after verification was struck.

c. Table 4.2.3.1 lists the overall descriptive statistics for preparing, entering and verifying a mission flight plan (prepare, Median = 32.6 minutes; enter and verify, Median = 11.1 minutes). However, the overall times are misleading as they included trials for planning that frequently started before receipt of the mission order. Crewmen received mission information during nightly briefings. Moreover, Fort Hood was familiar terrain which facilitated planning that occurred before the mission order was received and after launch of the AV.

d. Table 4.2.3.2 lists the mean times to prepare a mission flight plan. The table distinguishes between trials conducted after receiving the mission order (positive values) and trials conducted before receiving the mission order (negative values). The table also distinguishes between first, middle, and last trials of the day. Mean times for flight plans prepared after receiving the mission order ranged from 51.4 to 66.0 minutes. There were 18 trials where mission flight plans were prepared before receiving the mission order.

e. Tables 4.2.3.3 through 4.2.3.5 list the descriptive statistics for preparation of mission flight plans using stored plans or original plans (stored flight plan used = NO) by first, middle, and last trials of the day. Only the plans beginning after receiving the mission order were included. Times to prepare stored plans and original plan were surprisingly similar. Crewmen reported that modifying stored plans under the interruptive conditions in the GCS was a time-consuming task. Moreover, they reported that they would take their time modifying stored plans. Median times in minutes for preparing a flight plan included:

(1) First trials: Stored plans, Median = 33.4; Originals, Median = 36.5

(2) Middle trials: Stored plans, Median = 34.6; Originals, Median = 32.6

(3) Last trials: Stored plans, Median = 39.4; Originals, Median = 85.3

f. Table 4.2.3.6 lists the descriptive statistics for entering and verifying a mission flight plan. Less time was taken to enter and verify a stored flight plan (Median = 10 minutes) than was used to enter and verify an original flight plan (Median = 21.1 minutes). Other data indicated that there was no practical differences among first trial of the day (Mean = 15.0 minutes, N=33), middle trials of the day (Mean = 16.2 minutes, N=113), and last trials of the day (Mean = 10.1 minutes, N=37).

g. There were slight differences between type of GCS, CLRS, or FCS for preparing a flight plan (Mean FCS = 39.3 minutes, N=68; Mean CLRS = 29.6, N=113) and for entering and verifying a flight plan (Mean FCS = 20.7, N=68; Mean CLRS = 11.3, N=113).

h. The first trials of the day, using an original flight plan developed after receiving the mission orders, were likely to be most representative of a tactical situation. The sequence of critical tasks within the timeframe of the 60 minutes to launch system criteria included: 1_CTA0012 Emplacement of GCS (Median = 23.8 minutes), 13_CTA0031A Preparation time from mission order to flight plan entry (Median, first trial, Original plan = 36.5 minutes), and 13_CTA0031 Enter and verify AV mission plan

(Median, Original plan = 21.1 minutes). <u>The combined median time for preparing, entering, and verifying an original flight plan was 57.6 minutes and for the full sequence of tasks it totaled 81.4 minutes</u>. However, preparation of the flight plan occasionally began during GCS emplacement.

Table 4.2.3.1. Overall Descriptive Statistics for Preparing, Entering, and Verifying a Mission Flight Plan

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	182	SUM WGTS	182
MEAN	33.2255	SUM	6047.05
STD DEV	145.752	VARIANCE	21243.8
SKEWNESS	-3.2568	KURTOSIS	21.2599
USS	4046040	CSS	3845123
CV	438.676	STD MEAN	10.8039
T:MEAN=0	3.07533	PROB>|T|	0.00242872
SGN RANK	6578.5	PROB>|S|	0.0001
NUM ^= 0	179		
D:NORMAL	0.330251	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	501.783	99%	465.442
75% Q3	59.6625	95%	232.831
50% MED	32.625	90%	106.4
25% Q1	11.1	10%	0.0049998
0% MIN	-861	5%	-31.2608
		1%	-826.97
RANGE	1362.78		
Q3-Q1	48.5625		
MODE	0		

EXTREMES

LOWEST	HIGHEST
-861	316
-820	375
-722.7	419.083
-700	458
-100	501.783

13_CTA0031 FROM 87018 TO 87087
ENTER AND VERIFY AV MISSION PLAN

TOT_MIN SCORES > 150 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	185	SUM WGTS	185
MEAN	14.8027	SUM	2738.5
STD DEV	13.818	VARIANCE	190.937
SKEWNESS	1.94771	KURTOSIS	5.60347
USS	75669.6	CSS	35132.4
CV	93.3478	STD MEAN	1.01592
T:MEAN=0	14.5707	PROB>|T|	0.0001
SGN RANK	8510	PROB>|S|	0.0001
NUM ^= 0	184		
D:NORMAL	0.142039	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	84.2833	99%	75.9842
75% Q3	21.3667	95%	40.4567
50% MED	11.1333	90%	30.8233
25% Q1	5	10%	1.34
0% MIN	0	5%	0.941667
		1%	0.0143333
RANGE	84.2833		
Q3-Q1	16.3667		
MODE	5		

EXTREMES

LOWEST	HIGHEST
0	49.3333
0.0166667	56.5833
0.25	70
0.4	74.6333
0.5	84.2833

Table 4.2.3.2. Mean Time to Prepare a Mission Plan by First, Middle, and Last Trials of the Day

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY

GENERAL LINEAR MODELS PROCEDURE

BONFERRONI (DUNN) T TESTS FOR VARIABLE: IOT_MIN
NOTE: THIS TEST CONTROLS THE TYPE I EXPERIMENTWISE ERROR RATE
BUT GENERALLY HAS A HIGHER TYPE II ERROR RATE THAN REGWQ.

ALPHA=0.05 DF=155 MSE=15138.3
CRITICAL VALUE OF T=2.98138
MINIMUM SIGNIFICANT DIFFERENCE=174.759

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=8.81178

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

BON GROUPING		MEAN	N	TRIAL
	A	65.98	27	C_LAST_POS
	A			
B	A	57.58	107	B_MIDDLE_POS
B	A			
B	A	51.36	30	A_FIRST_POS
B	A			
B	A	-22.13	3	A_FIRST_NEG
B				
B		-116.95	8	B_MIDDLE_NEG
	C	-347.80	7	C_LAST_NEG

Table 4.2.3.3. Preparation of Flight Plan, First Trials of the Day

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=A_FIRST_POS ' STORED°FLIGHT PLAN° USED=YES

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
N	18	SUM WGTS	18	100% MAX	458	99%	458	LOWEST	HIGHEST
MEAN	60.8556	SUM	1095.4	75% Q3	59.4292	95%	458	4	45.8333
STD DEV	104.926	VARIANCE	11009.5	50% MED	33.4167	90%	145.367	5	100.217
SKEWNESS	3.53892	KURTOSIS	13.6597	25% Q1	9.23333	10%	4.9	5	105
USS	253822	CSS	187161	0% MIN	4	5%	4	7.43333	110.633
CV	172.418	STD MEAN	24.7313			1%	4	9.83333	458
T:MEAN=0	2.46067	PROB>|T|	0.024667	RANGE	454				
SGN RANK	85.5	PROB>|S|	.000213722	Q3-Q1	50.1958				
NUM ^= 0	18			MODE	5				
W:NORMAL	0.523085	PROB<W	<0.01						

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=A_FIRST_POS ' STORED°FLIGHT PLAN° USED=NO

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
N	12	SUM WGTS	12	100% MAX	89.85	99%	89.85	LOWEST	HIGHEST
MEAN	37.1292	SUM	445.55	75% Q3	44.725	95%	89.85	11.1333	39.2
STD DEV	21.5818	VARIANCE	465.772	50% MED	36.5417	90%	80.55	11.2667	39.45
SKEWNESS	1.27361	KURTOSIS	2.45297	25% Q1	23.2625	10%	11.1733	22.4833	46.4833
USS	21666.4	CSS	5123.5	0% MIN	11.1333	5%	11.1333	25.6	58.85
CV	58.1262	STD MEAN	6.23012			1%	11.1333	28.15	89.85
T:MEAN=0	5.95963	PROB>|T|	0.0001	RANGE	78.7167				
SGN RANK	39	PROB>|S|	0.00252617	Q3-Q1	21.4625				
NUM ^= 0	12			MODE	11.1333				
W:NORMAL	0.897792	PROB<W	0.198						

Table 4.2.3.4. Preparation of Flight Plan, Middle Trials of the Day

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=B_MIDDLE_POS STORED*FLIGHT PLAN* USED=YES

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS			
N	95	SUM WGTS	95
MEAN	59.6579	SUM	5667.5
STD DEV	82.6248	VARIANCE	6826.85
SKEWNESS	3.32505	KURTOSIS	12.6296
USS	979835	CSS	641724
CV	138.498	STD MEAN	8.47712
T:MEAN=0	7.03752	PROB>|T|	0.0001
SGN RANK	2280	PROB>|S|	0.0001
NUM ¬= 0	95		
D:NORMAL	0.251625	PROB>D	<0.01

QUANTILES(DEF=4)			
100% MAX	501.783	99%	501.783
75% Q3	67.5833	95%	272.21
50% MED	34.6167	90%	122.207
25% Q1	17.25	10%	4.65
0% MIN	0.0166667	5%	1.48
		1%	0.0166667
RANGE	501.767		
Q3-Q1	50.3333		
MODE	21.8667		

EXTREMES	
LOWEST	HIGHEST
0.0166667	271.3
0.05	275.85
0.4	316
1	419.083
1.6	501.783

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=B_MIDDLE_POS STORED*FLIGHT PLAN* USED=NO

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS			
N	12	SUM WGTS	12
MEAN	41.15	SUM	493.8
STD DEV	30.4091	VARIANCE	924.713
SKEWNESS	1.10878	KURTOSIS	0.606907
USS	30491.7	CSS	10171.8
CV	73.8981	STD MEAN	8.77835
T:MEAN=0	4.68767	PROB>|T|	.000663258
SGN RANK	39	PROB>|S|	0.00252617
NUM ¬= 0	12		
W:NORMAL	0.891637	PROB<W	0.157

QUANTILES(DEF=4)			
100% MAX	108.067	99%	108.067
75% Q3	68.525	95%	108.067
50% MED	32.6083	90%	98.0916
25% Q1	19.3417	10%	8.38833
0% MIN	5.93333	5%	5.93333
		1%	5.93333
RANGE	102.133		
Q3-Q1	49.1833		
MODE	5.93333		

EXTREMES	
LOWEST	HIGHEST
5.93333	37.5333
14.1167	50.65
18.7667	74.4833
21.0667	74.8167
23.15	108.067

Table 4.2.3.5. Preparation of Flight Plan, Last Trials of the Day

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=C_LAST_POS 'STORED*FLIGHT PLAN* USED=YES

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	24	SUM WGTS	24	100% MAX	242	99%	242	0.2	81
MEAN	55.0056	SUM	1320.13	75% Q3	75.0625	95%	240.442	0.883333	97.5833
STD DEV	64.6951	VARIANCE	4185.46	50% MED	39.3583	90%	171.381	1	107
SKEWNESS	2.0354	KURTOSIS	4.15491	25% Q1	10.8875	10%	0.941667	2	235.767
USS	168880	CSS	96265.5	0% MIN	0.2	5%	0.370833	3.43333	242
CV	117.616	STD MEAN	13.2058			1%	0.2		
T:MEAN=0	4.16525	PROB>|T|	.000373981	RANGE	241.8				
SGN RANK	150	PROB>|S|	0.0001	Q3-Q1	64.175				
NUM ¬= 0	24			MODE	0.2				
W:NORMAL	0.747943	PROB<W	<0.01						

13A_CTA0031A FROM 87018 TO 87087
TIME FROM MISSION ORDER TO
START OF FLIGHT PLAN ENTRY
TRIAL=C_LAST_POS 'STORED*FLIGHT PLAN* USED=NO

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	3	SUM WGTS	3	100% MAX	375	99%	375	1	
MEAN	153.767	SUM	461.3	75% Q3	375	95%	375	85.3	
STD DEV	196.175	VARIANCE	38484.8	50% MED	85.3	90%	375	375	
SKEWNESS	1.37923	KURTOSIS	.	25% Q1	1	10%	1		1
USS	147902	CSS	76969.5	0% MIN	1	5%	1		85.3
CV	127.58	STD MEAN	113.262			1%	1		375
T:MEAN=0	1.35762	PROB>|T|	0.307475	RANGE	374				
SGN RANK	3	PROB>|S|	0.161449	Q3-Q1	374				
NUM ¬= 0	3			MODE	1				
W:NORMAL	0.908628	PROB<W	0.381						

Table 4.2.3.6. Enter and Verify Flight Plan

13_CTA0031 FROM 87018 TO 87087
ENTER AND VERIFY AV MISSION PLAN

TOT_MIN SCORES > 150 MIN. DELETED
STORED•FLIGHT PLAN• USED=YES

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	156	SUM WGTS	156
MEAN	12.5902	SUM	1964.07
STD DEV	11.4937	VARIANCE	132.106
SKEWNESS	1.74542	KURTOSIS	4.59541
USS	45204.4	CSS	20470.4
CV	91.2913	STD MEAN	0.920235
T:MEAN=0	13.6815	PROB>|T|	0.0001
SGN RANK	6045	PROB>|S|	0.0001
NUM ¬= 0	155		
D:NORMAL	0.140779	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	70	99%	62.3522
75% Q3	18.7708	95%	32.1825
50% MED	10	90%	28.2917
25% Q1	4.56667	10%	1.12667
0% MIN	0	5%	0.861667
		1%	0.00949998
RANGE	70		
Q3-Q1	14.2042		
MODE	5		

EXTREMES

LOWEST	HIGHEST
0	40.5667
0.0166667	41.3
0.25	49.3333
0.4	56.5833
0.5	70

13_CTA0031 FROM 87018 TO 87087
ENTER AND VERIFY AV MISSION PLAN

TOT_MIN SCORES > 150 MIN. DELETED
STORED•FLIGHT PLAN• USED=NO

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	29	SUM WGTS	29
MEAN	26.7046	SUM	774.433
STD DEV	18.6933	VARIANCE	349.441
SKEWNESS	1.58055	KURTOSIS	3.00586
USS	30465.3	CSS	9784.34
CV	70.0004	STD MEAN	3.47127
T:MEAN=0	7.69304	PROB>|T|	0.0001
SGN RANK	217.5	PROB>|S|	0.0001
NUM ¬= 0	29		
W:NORMAL	0.851028	PROB<W	<0.01

QUANTILES(DEF=4)

100% MAX	84.2833	99%	84.2833
75% Q3	32.7667	95%	79.4582
50% MED	21.1	90%	46.5
25% Q1	13.7917	10%	8.49999
0% MIN	4.13333	5%	4.56667
		1%	4.13333
RANGE	80.15		
Q3-Q1	18.975		
MODE	4.13333		

EXTREMES

LOWEST	HIGHEST
4.13333	40.2
5	44.6667
8.5	46.5
8.61667	74.6333
8.91667	84.2833

4.2.4 Factors affecting 13_CTA0031 Prepare, enter, and verify AV mission plan:

A. Procedural Considerations

1. The mission commander plans the mission based on the mission order with assistance from the AVO as requested. This is accomplished on a worksheet. The MC reads the plan parameters to the AVO who enters the plan on the TTY. The printout from the TTY is then used to verify the plan against the worksheet with the AVO reading back the entered data to the MC. Any errors are then corrected through the editing process. Normally, the plan would be entered and verified prior to launch. However, in some cases where immediacy of the mission precluded prior entry, latter elements of the plan were entered after the launch.

2. No significant deviations from procedures were reported. However, wide variations in entry and verification times were observed, even when the plans required essentially the same number of overall entries. Crewmen explained that this was due largely to interruptions, distractions, typing speed of AVO, and the time available between receipt of the mission order and planned launch time. Also, from a practical standpoint, this task can begin as soon as the GCS has power and before mission orders are received.

B. Potential Errors

Note: Operators felt that the verification and system checkout procedures permitted few opportunities for errors. That is, they felt that any original errors would be caught and corrected, although doing so would result in mission delays. Nevertheless, they reported the following actual and potential errors:

1. Any time AutoCAL is calibrated on the wrong channel it must be corrected before RGT can talk to AV;

2. Failure to check paper in TTY and having to replace roll during planning;

3. Entry of incorrect site survey setup data;

4. Incorrect calculations of azimuth, range and elevation for handoff waypoint. (One operator stated that the computer catches errors at FCS and corrects them. One said these data come from Anderson Mountain.)

5. Incorrect entry of barometric pressure, or failure to input after receiving a weather update;

6. Incorrect alignment of the map placed on the NDU;

7. Selection of wrong altitude;

8. Failure to put in correct AV weight;

9. Entering wrong azimuth for RV or LV;

10. Entering wrong grids for waypoints or cued targets. (Despite verification procedures, AVOs felt that such errors had been made; however, they believed that these errors were caught and corrected by observing the NDU.)

11. Entering incorrect servo modes;

12. Communications voice errors with launcher crewmen; and

13. Communications when a single sender talks to one or more receivers, when there are two or more incoming messages (wire or radio), or when the intercoms and external messages are received in any combination.

C. Training Implications

1. Training in controlling the AV flight path to avoid sun angles that affect payload (glare or high reflections) during critical maneuvers or observation times.

2. Soldiers outside of the GCS crew want to be informed of RPV mission progress, mission commanders seldom conducted a preflight brief. During OT II the recovery crew did not have any idea of the tactical situation.

D. Human Engineering Considerations

1. The MPO and MC perform periodic data inputs on the data link rack at the rear of the GCS. This requires them to pass behind the AVO. The aisle space behind the AVO is inadequate and the AVO has to suspend his operation and move forward to allow passage. In MOPP gear this is extremely difficult.

2. Because of the restricted space behind the AVO, and because the communications rack is also directly behind him (with all the radio connectors oriented into the aisle), personnel are constantly bumping into the connectors. The potential exists for communications failure due to this.

3. Headspace is limited as well. With helmets and MOPP gear on, crewmen are very cramped in the workspace provided.

4. The XY plotter on the NDU is too large and occludes critical map information at points of interest.

5. The display for the end of tape light on the mission commander's console is not bright enough and is not accompanied by any audio backup.

6. The storage securing screw for the NDU plotter arm is located in an area that is difficult to access, making storage of the arm much more time consuming and difficult than it should be.

7. The NDU vacuum system is seldom used because of the excessive noise it creates.

8. In order to see what has been entered in the MICNS panel, the operator must kneel down or bend over.

9. The TTY operator must advance the paper in the TTY to see the entries on the line being entered, and unroll a scroll of TTY paper to see previous entries. This often requires him to stand up from his console.

10. Noise in the GCS interferes with hearing the radios and talk between other operators. The air conditioner/heater blower motor, blowers on the radios, teletype printing, vacuum on the map board, and generators all contribute to the problem.

E. Safety/Health Hazard

A small bracket extends outward directly beneath the TTY at knee height and has caused minor injuries to the AVO's knees.

F. Potential Solutions

1. A means of verifying the MIM codes while they are being entered would prevent the occasional loss of mission time due to inadvertent entry of incorrect codes. Also, electronic transmission of the codes to the launcher would eliminate the possibility of incorrect entry on the launcher.

2. Replace the teletypewriter (AN/UGC-74) with a less expensive alphanumeric input device, and add a plasma display for viewing/editing. The printer should be available to produce finished hard copy, only if it is necessary to have a hard copy.

4.3 Emplacement of RPV components

4.3.1 Emplacement of RPV components included:

a. 1_CTA0012 Emplacement of GCS.
b. 2_CTA0009 Emplacement of launch subsystem.
c. 3_CTA0011 Emplacement of recovery subsystem.
d. 4_CTA0010 Emplacement of remote ground terminal (RGT).

4.3.2 The RPV Operational and Organization Plan (O&O Plan, 1986, p. A-7)[2] contains operational criteria concerning emplacement. Emplacement, as described in the O&O plan, involved many overlapping and parallel tasks conducted by teams of crewmen. The tasks represented milestones that occur along with many other tasks during a 57-minute timeframe. The O&O plan operational criteria included:

a. Normal displacement and emplacement times for mission essential equipment are listed below. These times are based on survey control having been established and do not consider erection or teardown of tentage, camouflage nets, or laying or retrieval of external wirelines.

	Good visibility (daylight)	Reduced visibility (fog or darkness)
FCS/CLRS Displacement	30 min	60 min
FCS/CLRS Emplacement	60 min	90 min

b. Emplacement Time Requirements

EVENT	ELAPSED TIME
Begin Emplacement	0
Power Available at GCS	11
Begin Mission Planning	14
Power to Launcher, Warm-up Initializer	22
Power to RGT, Warm-up GDT	23
AV transferred to Launcher	33
MICNS/GDT System Check complete	45
Initializer Warm-up complete	46
Site setup data verified	47
Launch Subsystem ready	47
Mission Planning complete	48
Start Automatic Launch Sequence	48
Recovery Subsystem ready	50
Datalink established	53
Launch Air Vehicle	57

[2]Target Acquisition/Designation and Aerial Reconnaissance System (TADARS) Remotely Piloted Vehicle (RPV) Operational and Organization Plan (O&O Plan), U.S. Army Field Artillery School, Fort Sill, OK, 1986, (ATSF-TSM-RV).

c. Displacement is straightforward and should be accomplished within 30 minutes. FCS displacement is identical to displacement in the CLRS except that the only equipment in use at the FCS will be the ground control station, remote ground terminal, and generators.

4.3.3 The O&O plan emplacement time requirements implied that the following operational criteria were desirable for critical emplacement tasks:

a. GCS Emplacement, Begin emplacement to MICNS/GDT system check complete, 45 minutes.

b. Launcher Emplacement, Begin emplacement to launch subsystem ready, 47 minutes.

c. Recovery Emplacement, Begin emplacement to recovery subsystem ready, 50 minutes.

d. RGT Emplacement, Begin emplacement to site setup data verified, 47 minutes.

4.3.4 1_CTA0012 Emplacement of GCS

4.3.4.1 Procedural reference:

a. DEP 55-1550-200-CL-5 pages N-2 through N-4
b. TM 55-1550-20

4.3.4.2 The timed measure began when the GCS crossed the release point. The timed measure ended after the GCS equipment was operationally checked out.

4.3.4.3 Table 4.3.4.3 lists the overall descriptive statistics for 1_CTA0012 Emplacement of GCS. The median time to emplace the GCS (Median = 23.8 minutes) was less than the required O&O plan operational criteria of 45 minutes.

4.3.4.4 There Table 4.3.4.4 lists the mean times to emplace the GCS by week of the test. The range of means (Mean, lowest = 22.68 minutes; Mean, highest = 41.97 minutes) were all less than the O&O plan operational criteria of 45 minutes.

4.3.4.5 There was no practical difference between the mean times for emplacement of the CLRS GCS (Mean = 33.9 minutes, N=33) or the FCS GCS (Mean = 26.5 minutes, N=43). Moreover, there were no practical differences between first and last emplacements of the day (Mean, first = 29.7, N=59; Mean, last = 29.6, N=17).

4.3.4.6 Figure 4.3.4.6 shows the box and whisker plots of GCS emplacement times for both the CLRS (C) and FCS (F) by week of the test. A distinct pattern of elongated boxes, indicating increased variability, appears for CLRS emplacement in the second, fifth, and seventh weeks of the test. Review of other test data, including RAM and Meteorological data, were conducted and no explanations for the variance were found. The only pattern that appeared was in the crew records and in informal interviews for which the same NCO lead the CLRS GCS crew for emplacements of long durations. Most box and whisker plots in Figure 4.3.4.6 indicate consistency of performance.

Table 4.3.4.3. Overall Descriptive Statistics for GCS Emplacement

1_CTA0012 FROM 87018 TO 87087
EMPLACEMENT OF THE GCS

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	76	SUM WGTS	76
MEAN	29.7182	SUM	2258.58
STD DEV	18.1082	VARIANCE	327.907
SKEWNESS	1.47355	KURTOSIS	2.44771
USS	91714.1	CSS	24593
CV	60.933	STD MEAN	2.07715
T:MEAN=0	14.3072	PROB>|T|	0.0001
SGN RANK	1463	PROB>|S|	0.0001
NUM ¬= 0	76		
D:NORMAL	0.154308	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	95.9167	99%	95.9167
75% Q3	39.7458	95%	72.75
50% MED	23.8333	90%	50.095
25% Q1	16.7583	10%	12.5783
0% MIN	4.58333	5%	9.79583
		1%	4.58333
RANGE	91.3333		
Q3-Q1	22.9875		
MODE	12.3333		

EXTREMES

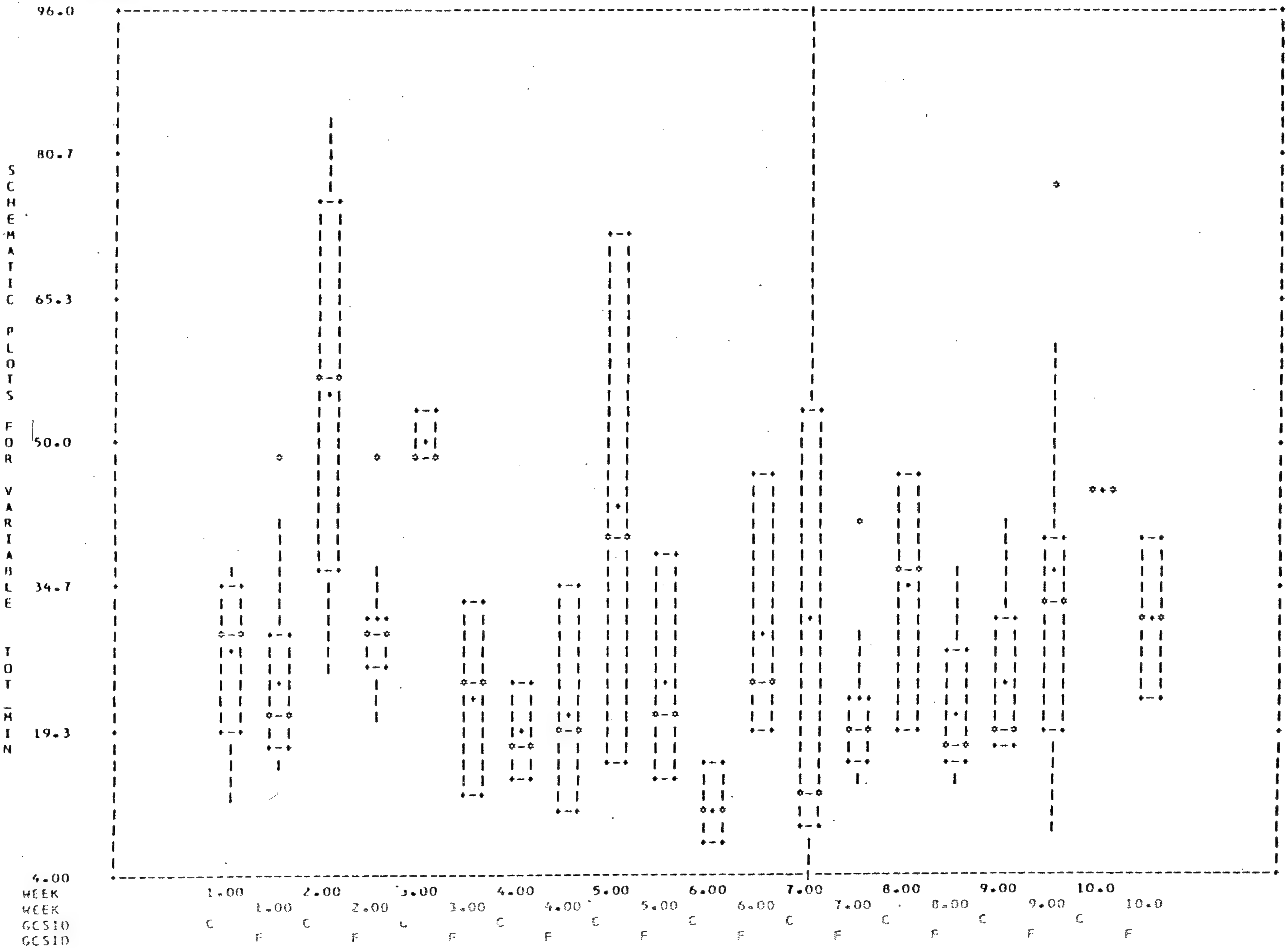
LOWEST	HIGHEST
4.58333	66.5833
7.75	72
9.58333	77
9.83333	84
10.3333	95.9167

Table 4.3.4.4. Mean Emplacement Times by Week of the Test

1_CTA0012 FROM 87018 TO 87087
EMPLACEMENT OF THE GCS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	12	25.76	10.41	12.68	48.83	3.00	309.17	108.30	40.39
WEEK=Wk2: 25-31 Jan									
TOT_MIN	9	41.97	21.46	21.02	84.00	7.15	377.70	460.52	51.14
WEEK=Wk3: 1-7 Feb									
TOT_MIN	6	36.61	15.79	13.00	52.65	6.45	219.65	249.24	43.12
WEEK=Wk4: 8-14 Feb									
TOT_MIN	6	20.12	8.53	10.33	34.75	3.48	120.73	72.75	42.39
WEEK=Wk5: 15-21 Feb									
TOT_MIN	6	33.40	21.91	14.68	72.00	8.95	200.38	480.19	65.61
WEEK=Wk6: 22-28 Feb									
TOT_MIN	5	22.68	14.40	7.75	46.00	6.44	113.42	207.28	63.47
WEEK=Wk7: 1-7 Mar									
TOT_MIN	13	26.42	24.75	4.56	95.92	6.86	343.50	612.35	93.65
WEEK=Wk8: 8-14 Mar									
TOT_MIN	7	27.26	12.47	15.00	46.37	4.71	190.83	155.54	45.75
WEEK=WK9: 15-21 MAR									
TOT_MIN	9	30.66	20.46	9.83	77.00	6.82	275.97	418.80	66.74
WEEK=Wk10: 22-28 Mar									
TOT_MIN	3	35.74	10.99	23.50	44.75	6.34	107.23	120.76	30.74

Figure 4.[illegible].6. Emplacement of the GCS: Box and whisker plots for GCS emplacement.



4.3.4.7 Factors affecting 1_CTA 0012 Emplacement of GCS:

A. Procedural Considerations

1. Existing cover and camouflage were not always used.

2. The 30 kw generator should be emplaced and made ready for supplying power as a first step.

3. Crewmen should ensure that the master switch of the generator is in the OFF position prior to activation.

4. The GCS generally does not require leveling because level terrain is selected for its positioning.

5. The air conditioning, exhaust blower power cables and antenna matching unit cables can be left in place to save time. In practice they are seldom disconnected.

6. The grounding rod is laid in an open trench. Trench needs to be deeper than potential frost line and deep enough to effectively distribute energy.

7. GCS should always be placed in a direction so that potential light emissions from the rear door will be away from the enemy.

8. GCS emplacement and directional orientation should allow for best propagation patterns from antenna lobes. Selection of high ground for emplacement is important in this respect.

9. The long range antenna (OE254) should be installed during emplacement. This is frequently omitted and eliminates one mode of communications.

10. GCS should be emplaced and checked out before MCPE. This is counter to current procedures. MCPE gets power from GCS.

11. Steps to power-up and activate the MCPE should be removed from this task and placed in the procedures for powering-up and activating the GCS and the MCPE.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Quality of the landline transmission is often too poor to hear data clearly;

2. Whip antennas are not always fully screwed into place and seated;

3. Distance from generator to GCS exceeds cable length, requiring repositioning of generator before power can be made available;

4. Forgetting to open generator doors vent will result in excessive heat buildup and could damage the generator or its motor;.

5. If the 30 kw generator is on line and generating power prior to hookup, and if connection is attempted with main generator power switch on, then potential exists for arcing and surge damage to other equipment that is on line; and

6. GCS not properly grounded may cause electrical interference problems with some equipment.

C. Training Implications

1. Site selection for deployment needs to be a training subject, particularly with regard to emplacement and directional orientation of the GCS for antenna signal propagation.

2. All aspects of the communications setup should be stressed in training, particularly as it applies to the sensitivity of antennas and the need for alternative frequency utilization.

3. Power-up sequences are important to maintain for proper startup and operation of the GCS. Training in this area needs to stress the importance of following the prescribed startup procedures.

4. The importance of cable connections and the interrelation of equipment linked together needs to be included in the training routines.

D. Manpower Implications

Additional manpower from the RGT advance crew is available, if needed.

E. Human Engineering Considerations

Low credibility was exhibited for technical manuals. Procedures and technical information are found to be incomplete, inaccurate, and not current.

F. Safety/Health Hazard

1. There is no safe way to climb to the top of the GCS shelter in order to place the antenna.

2. Tailgate on GCS is too heavy for one man and is at a height that could cause a lifting or strain injury if attempted.

4.3.5 2_CTA0009 Emplacement of launch subsystem.

4.3.5.1 Procedural reference:

a. DEP 55-1520-200-CL-5 pages N-2 through N-4
b. TM 55-1550-200

4.3.5.2 The timed measure started when the launcher crossed the release point or started from the hide position. The timed measure ended when the launcher heading was transmitted to the GCS.

4.3.5.3 Table 4.3.5.3 lists the overall descriptive statistics for 2_CTA0009 Emplacement of launch subsystem. The median time to emplace the launcher (Median = 6.45 minutes) was less than the O&O plan operational criteria of 47 minutes.

4.3.5.4 Table 4.3.5.4 lists the mean times to emplace the launcher by week of the test. The range of means (Mean, lowest = 5.50 minutes; Mean, highest, week 9 = 61.4 minutes) were less than the operational criteria of 47 minutes, with week 9 being the exception.

4.3.5.5 Figure 4.3.5.5 shows the box and whisker plots of launcher emplacement times by week of the test. The box and whisker plots show consistent and reasonable performance by launcher crewmen. The plot for week 5 was influenced by its small sample size (N=4). The mean for week 9 (Mean = 61.4) was affected by one extreme value (605 minutes). The median value (asterisks and dashed line, Median = 5.35) was less than the operational criteria of 47 minutes.

Table 4.3.5.3. Overall Descriptive Statistics for Launcher Emplacement

2_CTA0009 FROM 87018 TO 87087
EMPLACEMENT OF THE LAUNCH SUBSYSTEMS

TOT_MIN SCORES >100 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	77	SUM WGTS	77
MEAN	8.72165	SUM	671.567
STD DEV	7.74175	VARIANCE	59.9347
SKEWNESS	3.17433	KURTOSIS	13.4017
USS	10412.2	CSS	4555.04
CV	88.7648	STD MEAN	0.882254
T:MEAN=0	9.88564	PROB>|T|	0.0001
SGN RANK	1501.5	PROB>|S|	0.0001
NUM ¬= 0	77		
D:NORMAL	0.195024	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	51.3333	99%	51.3333
75% Q3	10.5583	95%	23.9916
50% MED	6.45	90%	15.4933
25% Q1	4.44167	10%	3.05666
0% MIN	0.566667	5%	1.82
		1%	0.566667
RANGE	50.7667		
Q3-Q1	6.11667		
MODE	5.35		

EXTREMES

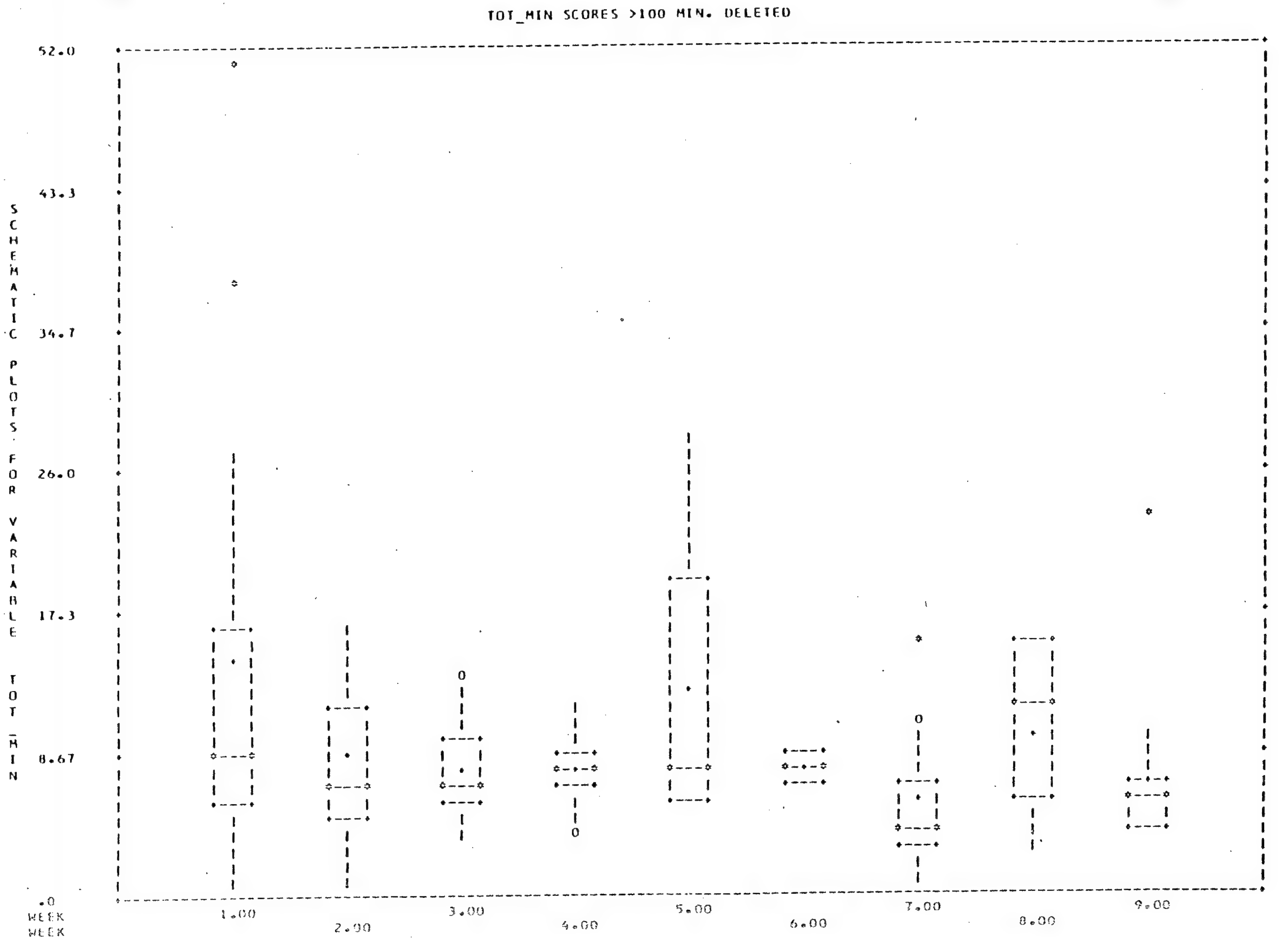
LOWEST	HIGHEST
0.566667	16.5333
1.13333	23.5333
1.25	28.1167
1.88333	37.1167
2	51.3333

Table 4.3.5.4. Mean Times to Emplace the Launcher by Week

2_CTA0009 FROM 87018 TO 87087
EMPLACEMENT OF THE LAUNCH SUBSYSTEMS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUF	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	13	23.45	35.36	1.25	131.07	9.81	304.90	1250.01	150.74
WEEK=Wk2: 25-31 Jan									
TOT_MIN	13	8.21	5.02	1.13	16.53	1.39	106.72	25.16	61.10
WEEK=Wk3: 1-7 Feb									
TOT_MIN	6	7.71	3.61	3.87	13.97	1.47	46.28	13.05	46.83
WEEK=Wk4: 8-14 Feb									
TOT_MIN	6	7.81	2.29	4.22	11.13	0.94	46.85	5.26	29.39
WEEK=Wk5: 15-21 Feb									
TOT_MIN	4	12.47	10.62	5.58	28.12	5.31	49.90	112.77	85.12
WEEK=Wk6: 22-28 Feb									
TOT_MIN	2	7.55	1.56	6.45	8.65	1.10	15.10	2.42	20.60
WEEK=Wk7: 1-7 Mar									
TOT_MIN	17	5.50	3.67	0.57	15.08	0.89	93.43	13.44	66.71
WEEK=Wk8: 8-14 Mar									
TOT_MIN	7	9.91	4.94	2.43	15.33	1.87	69.40	24.38	49.81
WEEK=Wk9: 15-21 Mar									
TOT_MIN	11	61.38	180.42	3.72	605.08	54.40	675.13	32549.59	293.95

Figure 4 5.5. Emplacement of the launch subsystems: Box and whisker plots for launcher emplacement.



4.3.5.6 Factors affecting 2_CTA0009 Emplacement of launch subsystem:

A. Procedural Considerations

1. With proper site selection procedures, the AV could be launched from the hide position.

2. In establishing an azimuth for the LV rail an undeclinated compass must be used to avoid doubling the correction angle when the computer automatically adjusts for magnetic north.

3. Procedures for the use of the compass need to emphasize the distance from metal objects that must be maintained in order to get an accurate reading.

4. Launcher grounding trenches should be dug where conditions permit and below the potential frost line.

B. Potential Errors

1. LV can be positioned over wrong survey stake, thereby introducing an initialization error into the system. Launcher and recovery vehicle survey stakes are often placed close together.

2. Azimuth information that is communicated to the GCS needs to be verified to prevent error.

3. Failure to set the truck engine at correct RPM setting can cause hydraulic pressure loss. This can affect launching of the AV.

4. Failure to use an undeclinated compass can introduce an error of the magnitude of the difference between grid north and magnetic north.

C. Training Implications

1. Locating the LV properly in its hide position and launch position requires an appreciation of the time impact on mission execution. Training scenarios can be employed to illustrate these considerations.

2. Training manuals do not cover the use of the M2 compass and consequently, some inadvertent azimuth errors can occur (e.g., too close to metal objects or large pieces of equipment) when readings are taken. Crewmen need to use an undeclinated compass.

3. The need for grounding the LV has not been made clear to the crewmen. Training in this procedure needs to be emphasized. They should be taught why grounding is important and how to do it properly.

4. Operators feel the need for more "hands-on" training and less classroom time.

D. Manpower Implications

Manpower is sufficient as launcher and recovery crews interchange to perform tasks.

E. Human Engineering Considerations

1. Workspace on the LV platform is limited, and with the AV in place crewmen movement is highly restricted. Crewmen are forced to work in awkward positions and are at hazard for slip and fall accidents. Workspace restrictions directly impact the time to perform tasks.

2. A low gear ratio on the manually operated LV crane increases operator workload and AV setup time. MIL-STD-1472C should be reviewed to determine if a higher gear ratio is possible for use by all crewmen.

F. Safety/Health Hazard

1. The launch vehicle and air vehicle handler trucks are often inappropriately positioned in relation to each other, facing in opposite directions. In these cases, the AV handler truck's exhaust pipe is blowing noxious exhaust fumes into the work area of the operating crewmen. This condition also creates a potential sparking hazard when fuel is spilled.

2. The launcher needs to be grounded as do other vehicles.

3. The crane support stand for the crane microswitch is in a walkway and is struck by crewmen causing leg injuries.

G. Maintenance

Inappropriate PMCS and lubrication procedures relating to the crane on the LV contributed to the crane handler slipping out of its detent and striking a crewman on the hands.

H. Equipment

1. The LV needs a larger communications wire reel if it is to deploy up to 1000 meters from the GCS. A possible mounting place would be inside the forward boom brace.

2. Relocate the crane microswitch and eliminate the support stand to avoid injuries and tripping hazards.

4.3.6 3_CTA0011 Emplacement of recovery subsystem

4.3.6.1 Procedural reference:

a. DEP 55-1550-200-CL-6 page N-1
b. TM 55-1550-200

4.3.6.2 The timed measure began when the recovery vehicle crossed the release point or started from the hide position. The timed measure ended when the vehicle leveling was completed or the azimuth was reported to the GCS, whichever was last to be performed.

4.3.6.3 Table 4.3.6.3 lists the overall descriptive statistics for 3_CTA0011 Emplacement of recovery subsystem. The median time to emplace the recovery vehicle (Median = 2.19 minutes) was very low. In order to address the operational criteria of the O&O plan, the additional tasks of 8_CTA0096 Prepare recovery subsystem for recovery (Median = 27.8 minutes) and 9_CTA0100 Deploy recovery subsystem barrier support structure (Median = 7.26 minutes) were considered. The tasks are discussed in later sections. The total median time for the critical tasks (Median = 37.3 minutes) was within the O&O plan operational criteria of 50 minutes.

4.3.6.4 Table 4.3.6.4 lists the mean times to emplace the recovery vehicle, the distance traveled, and rate of travel per 100 meters by week of the test. Distances traveled were reduced during the later weeks of the test (weeks 4 through 9). The rate of travel also increased during the same time period. Overall, the distance traveled had little impact on the success of the task. Presumably, the less distance traveled, the closer the recovery vehicle is to the tree line and hide position, improving survivability. The range of mean times to emplace were low and similar (Mean, lowest = 0.8 minute; Mean, highest = 3.37 minutes).

4.3.6.5 Figure 4.3.6.5 shows the box and whisker plots for emplacement of the recovery vehicle. The length of the boxes indicates that emplacement trials were consistent. Weeks 5 and 6 were affected by small sample sizes (N=3 and 2, respectively).

4.3.6.6 Figure 4.3.6.6 shows the box and whisker plots for first, middle, and last trials of the day. First trials of the day required more time (Mean, first = 2.5 minutes, N=35) than middle or last trials (Mean, middle = 2.1 minutes, N=28; Mean, last = 1.98 minutes, N=19). The differences were due to the procedural steps involved in laying RGA and communication ground wires and recording the vehicle azimuth for first trials.

Table 4.3.6.3. Overall Descriptive Statistics for Emplacement of the Recovery Vehicle

3_CTA0011 FROM 87018 TO 87087
EMPLACEMENT OF THE RECOVERY VEHICLE

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	80	SUM WGTS	80
MEAN	2.26792	SUM	181.433
STD DEV	1.37953	VARIANCE	1.90312
SKEWNESS	1.24546	KURTOSIS	2.10704
USS	560.009	CSS	150.346
CV	60.9627	STD MEAN	0.154237
T:MEAN=0	14.6717	PROB>|T|	0.0001
SGN RANK	1620	PROB>|S|	0.0001
NUM ¬= 0	80		
D:NORMAL	0.119153	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	7.05	99%	7.05
75% Q3	2.9625	95%	5.47667
50% MED	2.19167	90%	3.945
25% Q1	1.1375	10%	0.716667
0% MIN	0.15	5%	0.6175
		1%	0.15
RANGE	6.9		
Q3-Q1	1.825		
MODE	0.716667		

EXTREMES

LOWEST	HIGHEST
0.15	5.03333
0.333333	5.5
0.433333	5.86667
0.616667	6.63333
0.633333	7.05

Table 4.3.6.4. Mean Times to Emplace the Recovery Vehicle by Week of the Test

3_CTA0011 FROM 87018 TO 87087
EMPLACEMENT OF THE RECOVERY VEHICLE

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK1: 18-24 Jan									
TOT_MIN		14	1.72	1.60	0.15	6.63	0.43	24.02	2.56
DISTTVLD	DISTANCE*TRAVELED	14	96.43	9.08	75.00	100.00	2.43	1350.00	82.42
RATE	MIN. PER *100 METERS	14	1.79	1.61	0.15	6.63	0.43	24.99	2.60
WEEK=WK2: 25-31 Jan									
TOT_MIN		14	2.17	1.46	0.33	5.87	0.39	30.38	2.12
DISTTVLD	DISTANCE*TRAVELED	14	86.79	21.18	35.00	110.00	5.66	1215.00	448.49
RATE	MIN. PER *100 METERS	14	2.81	2.13	0.33	7.82	0.57	39.31	4.55
WEEK=WK3: 1-7 Feb									
TOT_MIN		6	3.21	2.06	1.10	7.05	0.84	19.25	4.23
DISTTVLD	DISTANCE*TRAVELED	6	115.00	109.32	40.00	300.00	44.63	690.00	11950.00
RATE	MIN. PER *100 METERS	6	3.82	2.06	1.67	6.60	0.84	22.91	4.25
WEEK=WK4: 8-14 Feb									
TOT_MIN		6	2.43	1.74	0.95	5.50	0.71	14.58	3.04
DISTTVLD	DISTANCE*TRAVELED	6	40.00	30.00	25.00	100.00	12.25	240.00	900.00
RATE	MIN. PER *100 METERS	6	8.41	7.71	1.38	22.00	3.15	50.43	59.40
WEEK=WK5: 15-21 Feb									
TOT_MIN		3	1.94	0.41	1.53	2.35	0.24	5.82	0.17
DISTTVLD	DISTANCE*TRAVELED	3	25.00	0.00	25.00	25.00	0.00	75.00	0.00
RATE	MIN. PER *100 METERS	3	7.76	1.63	6.13	9.40	0.94	23.27	2.67
WEEK=WK6: 22-28 Feb									
TOT_MIN		2	0.84	0.18	0.72	0.97	0.13	1.68	0.03
DISTTVLD	DISTANCE*TRAVELED	2	75.00	0.00	75.00	75.00	0.00	150.00	0.00
RATE	MIN. PER *100 METERS	2	1.12	0.24	0.96	1.29	0.17	2.24	0.06
WEEK=WK7: 1-7 Mar									
TOT_MIN		16	1.99	0.53	0.87	2.70	0.13	31.77	0.28
DISTTVLD	DISTANCE*TRAVELED	16	26.56	2.39	25.00	30.00	0.60	425.00	5.73
RATE	MIN. PER *100 METERS	16	7.52	2.07	3.47	10.47	0.52	120.40	4.29
WEEK=WK8: 8-14 Mar									
TOT_MIN		9	2.20	1.32	0.43	3.98	0.44	19.82	1.74
DISTTVLD	DISTANCE*TRAVELED	9	30.56	9.17	25.00	50.00	3.06	275.00	84.03
RATE	MIN. PER *100 METERS	9	7.91	5.46	1.47	15.93	1.82	71.17	29.84

Table 4.3.6.4. Mean Times to Emplace the Recovery Vehicle by Week of the Test (Cont.)

3_CTA0011 FROM 87018 TO 87087
EMPLACEMENT OF THE RECOVERY VEHICLE

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=Wk9: 15-21 Mar									
TOT_MIN		10	3.37	0.88	2.20	5.03	0.28	33.72	0.78
DISTTVLD	DISTANCE TRAVELED	10	39.00	3.16	30.00	40.00	1.00	390.00	10.00
RATE	MIN. PER 100 METERS	10	8.74	2.55	5.50	12.58	0.81	87.42	6.50

Figure 4.3.6.5. Box and whisker plots for emplacement of the recovery vehicle by week of test.

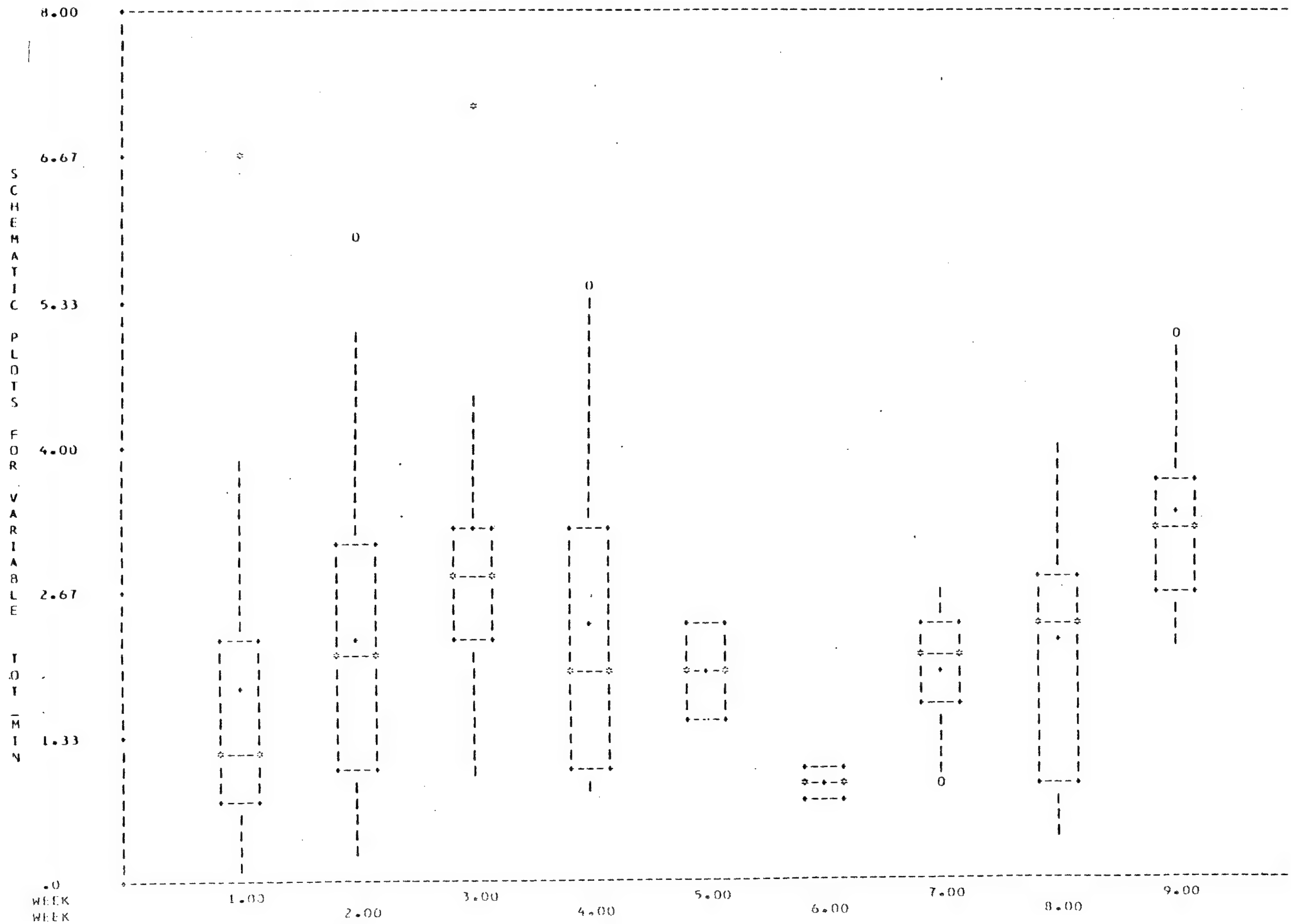
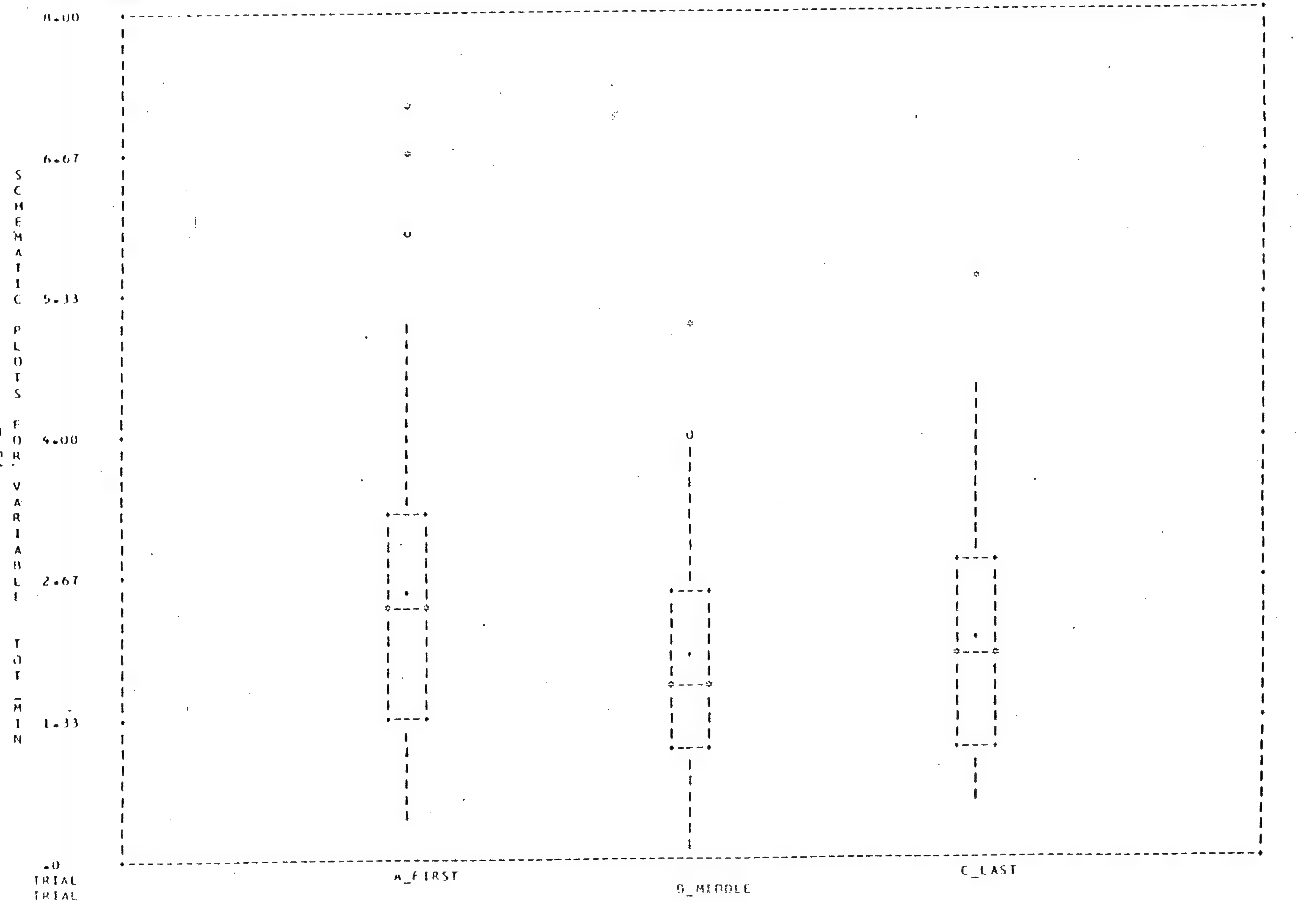


Figure 4.[illegible]6. Box and whisker plots for emplacement of the recovery vehicle by first, middle, and last trials of the day



4.3.6.7 Factors affecting 3_CTA0011 Emplacement of recovery subsystem:

A. Procedural Considerations

1. One mandated procedure for this task is to remove the 28 vdc slave connector from the truck cab outlet prior to moving. In practice the operators leave the connector in place except when the outlet is needed to jump start the vehicle.

2. In most cases the telephone and RGA lines can be laid during first emplacement and are left in place thereafter.

3. Time to emplace would be reduced if a double wrapped wire was used for both communication and RGA landlines rather than single lines.

4. Azimuth readings must be made with attention to wind direction. A conscious effort must be made to align the system into the wind, otherwise an unwarranted stress could be introduced into the recovery because of crosswind corrections and higher than programmed recovery speeds.

B. Potential Errors

1. Failure to use an undeclinated compass can introduce an error of the magnitude of the difference between grid north and magnetic north.

2. As with the LV, compass readings taken in proximity to metal objects or large equipment introduce errors into the system.

3. Failure to monitor the wind direction for changes can cause crosswind recoveries or higher than computed recovery speeds resulting in AV damage.

4. Not leveling the RV to within seven degrees displaces the glide slope angle outside an acceptable recovery envelope.

C. Training Implications

Comments made for LV are applicable here also.

D. Manpower Implications

Manpower is sufficient as launcher and recovery crews interchange to perform tasks.

E. Human Engineering Considerations

1. Space for walking on the RV platform is restricted by objects which affect the time to perform tasks. For example, crewmen walk on control cabinets and the barrier structure. Non-slip surfaces are not provided. Tripping hazards are present.

2. The dipstick in the hydraulic reservoir cannot be read accurately because the graduated markings are both too faint and lack definitive graduations.

3. The temperature gauge for the brake drum is recessed too far into the equipment panel and is difficult to read. If the temperature compensation adjustment is not made, or made incorrectly, when setting brake tension, the resulting brake tension could cause damage to the AV.

4. The arrangement and layout of the signal processing assembly/power distribution and control panel should be revised to eliminate a redundancy in control switches and to make the hydraulic fluid temperature gauge more accessible and readable.

5. The leveling meters and the location of the platform sensors used for aligning the RGA camera platform may not be providing appropriate information for properly aligning camera platforms and barrier structure. RGA camera angles are critical to the recovery process.

6. A "tell tail" wind direction indicator placed on the recovery vehicle would facilitate crew checks of wind direction.

F. Safety/Health Hazard

1. The location of the reel for the field ground wire is located behind the truck cab on the platform of the RV. The stowage position of the reel requires a crewman to lift the reel approximately six feet from the ground. The reel weighs over 200 pounds when full of wire and requires a two-man lift at a minimum.

2. There are numerous slippery surfaces on the walkways of the recovery vehicle that need to be treated to avoid slip and fall accidents. Crewmen often walk on the folded barrier structure in order to check cables and hydraulic lines.

3. There are stamped metal platforms in use at several locations on the RV that, while preventing slip and fall accidents, may cause crewmen injury because of the sharpness of the edges in the stamped patterns.

4. Guardrails for the operator platform on the barrier structure become loose and cause a loss of balance by crewmen relying on them.

5. The safety envelope around the RV during recovery is not well defined. Operators and observers apparently do not understand the potential hazard should an AV strike the barrier structure.

G. Maintenance

Several of the flexible hydraulic lines routed on the side opposite the RGA camera on the barrier structure are linked together with plastic tie wraps. These ties break and there is a potential for equipment damage.

4.3.7 4_CTA0010 Emplacement of remote ground terminal (RGT)

4.3.7.1 Procedural reference:

a. DEP 55-1520-200-C4-4 pages N-1 through N-5
b. TM 55-1550-200

4.3.7.2 The timed measure began when the RGT stopped over the RGT survey stake. The timed measure ended when the RGT positioning angles were transmitted to the GCS.

4.3.7.3 Table 4.3.7.3 lists the overall descriptive statistics for 4_CTA0010 Emplacement of remote ground terminal (RGT). The median time to emplace the RGT (Median = 43.0 minutes) was less than the O&O plan operational criteria of 47 minutes.

4.3.7.4 Table 4.3.7.4 lists the mean times for emplacement of the RGT by week of the test. The O&O plan operational criteria of 47 minutes was exceeded during weeks 3, 5, 8, and 9 (Means: week 3 = 55.1 minutes; week 5 = 52.7 minutes; week 8 = 48.7 minutes; and week 9 = 53.7 minutes).

4.3.7.5 Figure 4.3.7.5 shows the box and whisker plots for emplacement of the RGT by week of the test. Emplacement mean and median times were high throughout the test. The long length of the boxes indicates a great deal of variability in crew performance throughout the test.

4.3.7.6 Figure 4.3.7.6 shows box and whisker plots for emplacement of the RGT by CLRS (C) and FCS (F) association. The CLRS RGT required more time to emplace (Mean = 60.0 minutes, N=28) than did the FCS RGT (Mean = 36.9 minutes, N=35). Advance crews for the CLRS and FCS performed RGT emplacement using different sequences of procedures. For example, FCS RGT crews carefully used the truck to pull the RGT onto location and minimized the need for three men to lift, disconnect, and reposition the RGT. Moreover, the generators were positioned, inspected, connected, and started first in order to begin RGT warmup while other emplacement tasks were conducted. Figure 4.3.7.6 also indicates that CLRS RGT mean emplacement time (Mean = 60.0 minutes) was greater than the O&O plan operational criteria of 47 minutes. Of the 28 CLRS RGT trails analyzed, 20 trials exceeded the operational criteria.

4.3.7.7 Figure 4.3.7.7 shows box and whisker plots for emplacement of the RGT by first, middle, and last trials of the day. There were no practical differences between the trials (Mean, first = 52.5 minutes, N=32; Mean, middle = 49.0 minutes, N=10; Mean, last = 38.0 minutes, N=21). Conducting tasks during low light conditions of first trials was reported by crewmen to be time consuming.

Table 4.3.7.3. Overall Descriptive Statistics for Emplacement of the RGT.

4_CTA0010 FROM 87018 TO 87087
EMPLACEMENT OF THE REMOTE GROUND TERMINAL (RGT)

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	63	SUM WGTS	63
MEAN	47.164	SUM	2971.33
STD DEV	20.6743	VARIANCE	427.425
SKEWNESS	0.568597	KURTOSIS	-0.553333
USS	166640	CSS	26500.3
CV	43.8348	STD MEAN	2.60471
T:MEAN=0	18.1072	PROB>|T|	0.0001
SGN RANK	1008	PROB>|S|	0.0001
NUM ¬= 0	63		
D:NORMAL	0.0972376	PROB>D	0.142

QUANTILES(DEF=4)

100% MAX	94.0667	99%	94.0667
75% Q3	60.05	95%	89.8967
50% MED	43	90%	80.17
25% Q1	30	10%	21.4467
0% MIN	15.7167	5%	19.7333
		1%	15.7167
RANGE	78.35		
Q3-Q1	30.05		
MODE	41		

EXTREMES

LOWEST	HIGHEST
15.7167	80.4167
18.5833	89.4833
19.6667	90
20	90.9333
21.1667	94.0667

Table 4.3.7.4. The Mean Times for Emplacement of the RGT by Week of the Test

4_CTA0010 FROM 87018 TO 87087
EMPLACEMENT OF THE REMOTE GROUND TERMINAL (RGT)

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=Wk1: 18-24 Jan									
TOT_MIN	9	43.61	16.70	23.45	67.82	5.57	392.45	278.95	38.30
WEEK=Wk2: 25-31 Jan									
TOT_MIN	7	41.91	18.75	27.00	89.42	7.09	293.37	351.47	44.73
WEEK=Wk3: 1-7 Feb									
TOT_MIN	3	55.13	20.78	33.15	74.47	12.00	165.38	431.99	37.70
WEEK=Wk4: 8-14 Feb									
TOT_MIN	6	43.84	12.71	31.07	68.00	5.19	263.05	161.52	28.99
WEEK=Wk5: 15-21 Feb									
TOT_MIN	4	52.67	10.56	38.00	63.00	5.28	210.68	111.45	20.04
WEEK=Wk6: 22-28 Feb									
TOT_MIN	4	45.17	29.58	19.67	80.28	14.79	180.67	874.90	65.49
WEEK=Wk7: 1-7 Mar									
TOT_MIN	12	41.11	19.43	21.17	89.48	5.61	493.35	377.62	47.27
WEEK=Wk8: 8-14 Mar									
TOT_MIN	8	48.72	27.99	18.58	94.07	9.90	389.73	783.37	57.45
WEEK=Wk9: 15-21 Mar									
TOT_MIN	7	53.38	27.68	15.72	90.93	10.46	443.65	766.16	43.67
WEEK=Wk10: 22-28 Mar									
TOT_MIN	3	46.33	12.10	37.00	60.00	6.98	139.00	146.33	26.11

Figure 4.3.7.5. Box and whisker plots for emplacement of the RGT by week of the test.

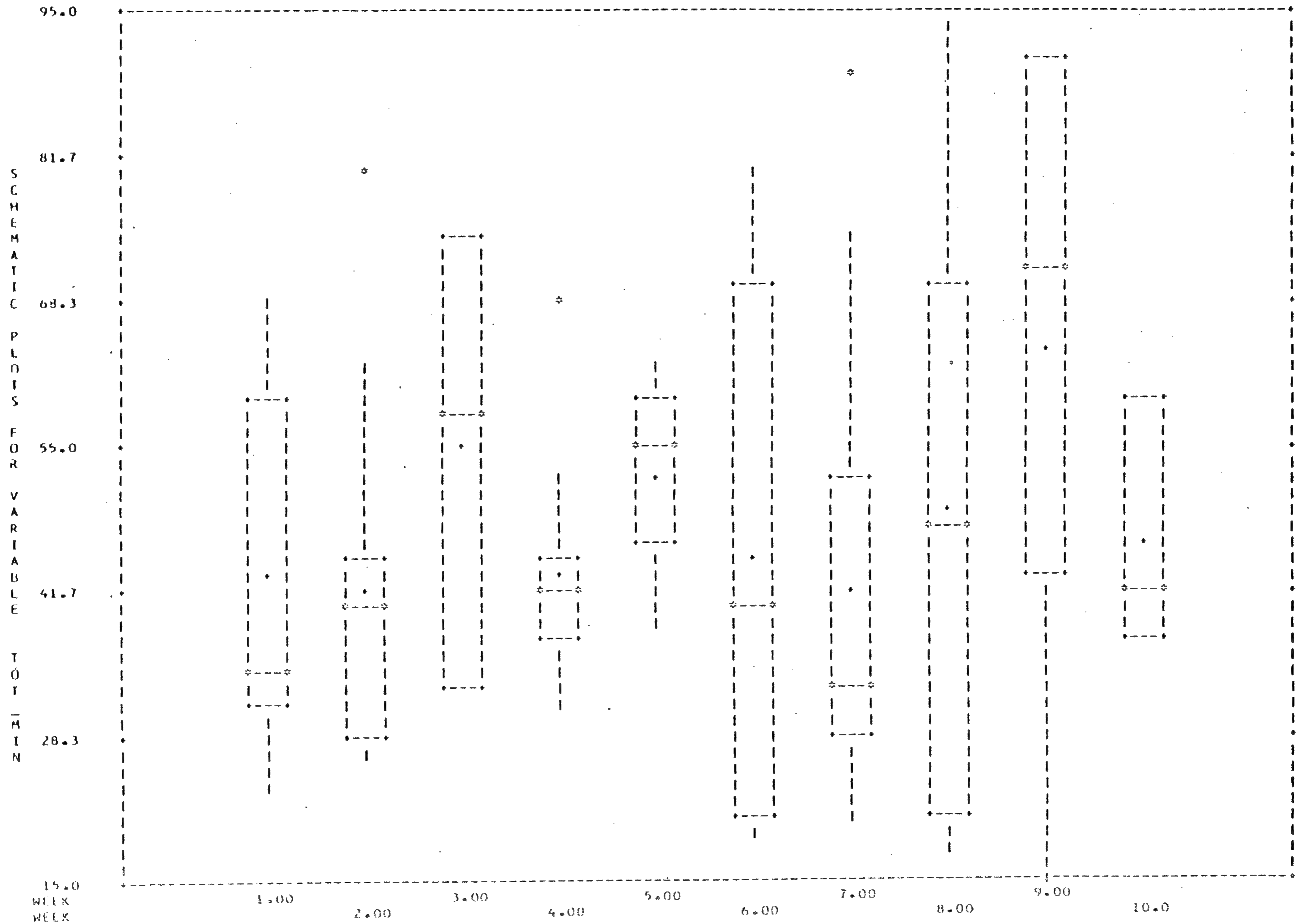


Figure 4.3 6. Box and whisker plots for CLRS and FCS RGT emplacement.

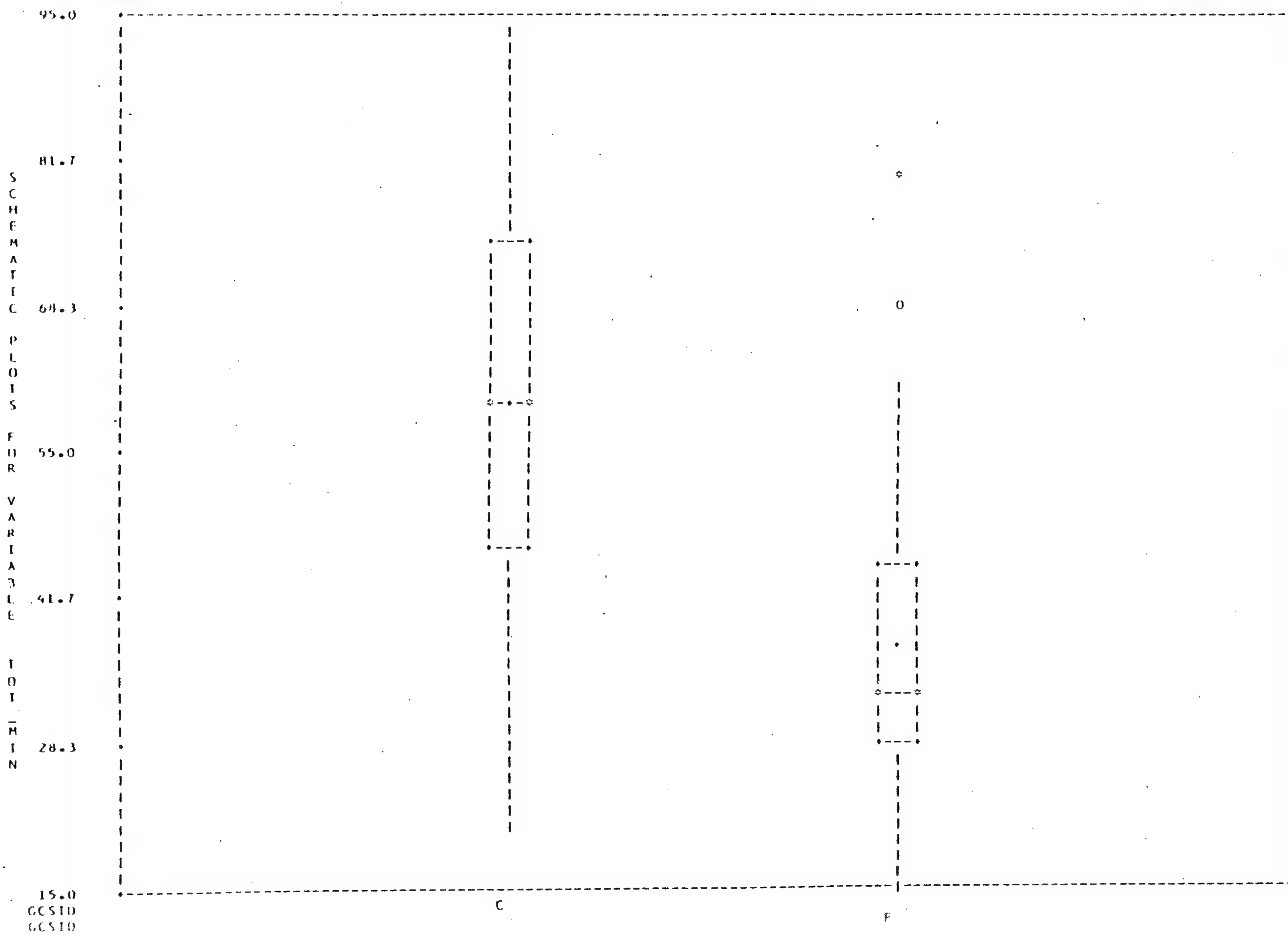
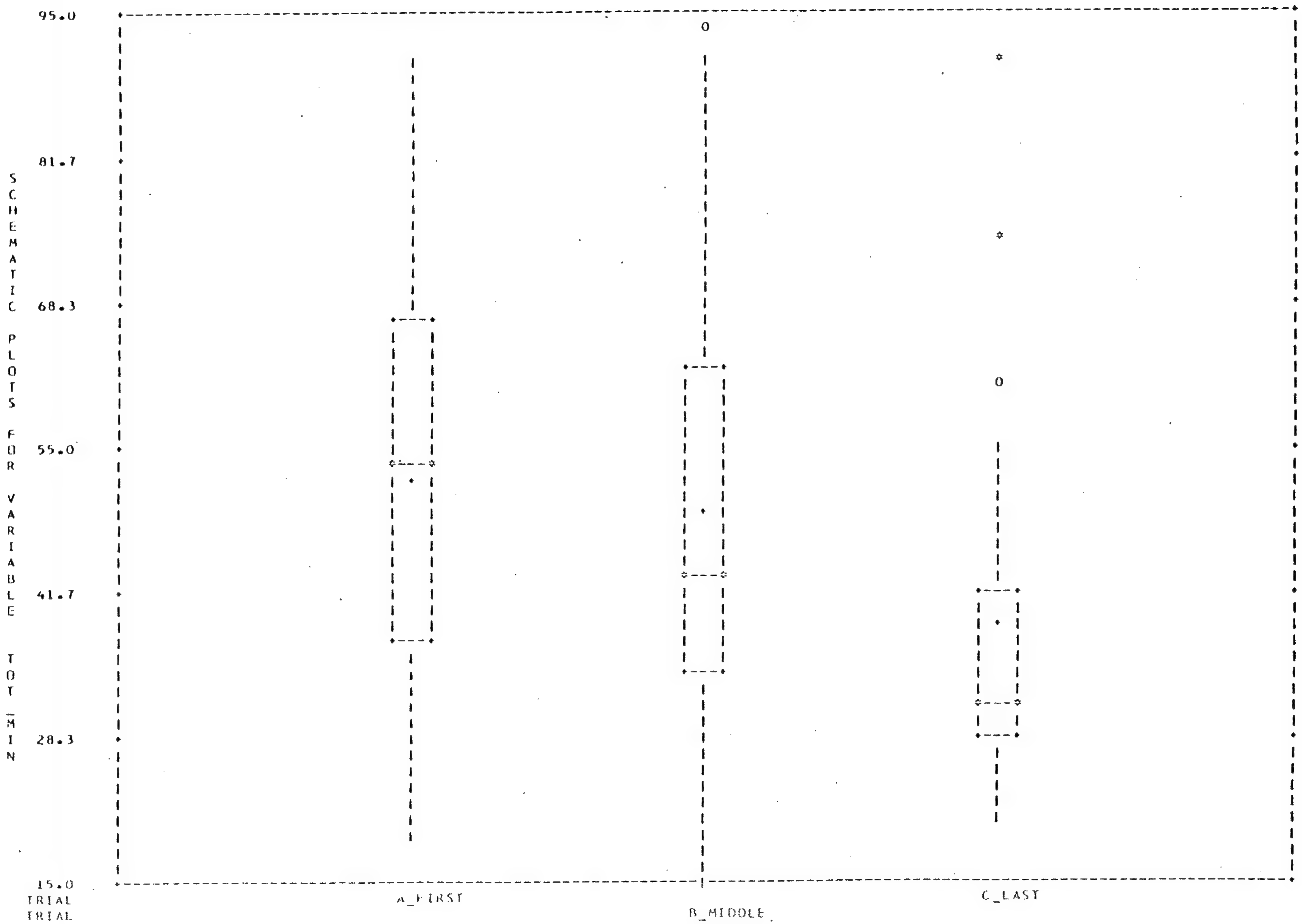


Figure 4.3.7.7. Box and whisker plots for RGT emplacement by first, middle, and last trials of the day.



4.3.7.8 Factors affecting 4_CTA0010 Emplacement of remote ground terminal (RGT):

A. Procedural Considerations

Note: Information relating to the RGT is included under two CTAs: this one, and CTA0004 Locate and align RGT. Rather than repeat information for the two tasks, most is included in this discussion. (See CTA0004 for specific topics unique to that task.)

1. The voltage meters on the generator are not accurate. Their readings need to be confirmed with the use of a multimeter.

2. The alignment of the RGT is difficult at night if procedures are not fully followed.

3. Survey procedures among the RGT, LV, and RV need to be refined.

4. Communications hookup procedures need to be followed more closely to avoid the loss of communications due to misconnection.

5. Initial positioning of the generators should be within the length of the available power cables to avoid repositioning of the generators. Often crewmen laying FO cables are unavailable to help lift the generators. This delays RGT warmup.

6. An off-load inventory should be made of setup equipment and supplies before transport vehicle leaves the area of the RGT.

7. The carry/storage area on the RGT is not used because it requires two or three men to lift and carry the generators into place. Crewmen store and transport generators on mission commander's vehicle and drop them where they are wanted.

8. Three control switches, the main power, battery, and antenna safe, must be activated in sequence (left to right) or equipment damage may occur. A safety circuit to preclude damage may be necessary.

B. Potential Errors

1. Failure to maintain fuel levels in the generators and reservoir fuel cans can cause the generators to shut down. The selector fuel switch for the generators and reservoir must be set appropriately.

2. Failure to raise the RGT sufficiently to avoid losing its level position after it settles when positioned on soil.

3. Failure to check the generator (1.5 kw) or reservior tank fuel fill levels while the generator is operating.

C. Training Implications

1. Training on the 1.5 kw generator needs to be expanded to give crewmen more knowledge on how it should be operated and maintained (PMCS).

2. The number of survey points for the RPV are more than that used for a firing battery. This requires that survey techniques be fully understood. The impact on mission capabilities needs to be appreciated, especially in aligning the RGT. Additional training in this area is needed.

3. Picking the best routes to the site needs to be stressed in setup procedures.

4. TM DEP 55-1550-200-10-3, task 2-23, contains information that is contained in the 1/4 ton trailer manual. It also contains information about the reeling machine that is contained in the reeling machine basic manual. Crewmen did not understand the implications on equipment performance, if not grounded.

D. Manpower Implications

The addition of carrying the generators on the truck to lower its position and a wheeled jack on the RGT trailer hitch, could reduce the number of personnel needed to emplace the RGT by one man. Two-man rather than three-man advance parties would suffice.

E. Human Engineering Considerations

1. Stabilizer pads are held down (for transport) by a second generation device designed to replace one made of aluminum that was subject to excessive wear.

2. New design creates problems for operators because of the size of the take-up mechanism in relation to the space available for it.

3. Stabilizer ball locking mechanism is oriented in the wrong direction. It currently faces toward the front of the vehicle. The proper orientation should be toward the rear.

4. The fiber optics cable reel should be designed into the trailer to allow the cables to be spooled directly from the RGT.

F. Safety/Health Hazard

The fiber optics cable reel is heavier than a single man can handle. Two men are required to avoid injury.

G. Maintenance

The tarps covering the RGT wear out from wind and abrasion during road marches.

H. Potential Solutions

1. Recommend that appropriate manuals be referenced, not reprinted.

2. Perhaps a system could be devised where the RGT is provided the only survey points. The other vehicle's RV and LV might then have several predetermined alternative points based on the RGT location to choose from for locations. Thus, the need for separate survey points could be minimized.

4.4 5_CTA0083 Install/stow fiber optics cables

4.4.1 Procedural reference:

a. DEP-55-1550-200-CL-4 pages N-1 through N-3
b. TM 55-1550-200

4.4.2 Installation timed measure began when the cable reel was prepared for emplacement. Installation time measure ended when both FO cables were connected. Stowage timed measure began when the cable reel was prepared for collection of the FOC. Stowage timed measure ended when both FO cables were on reels and the reels were stowed on the RGT.

4.4.3 Table 4.4.3.1 lists the overall descriptive statistics for the mean time to install the FOC (Mean = 19.2 minutes), the mean distance traveled during installation (Mean = 162 meters), and the rate of travel during installation (Mean = 23.04 minutes per 100 meters). Table 4.4.3.2 lists the overall descriptive statistics for the mean time to collect the FOC (Mean = 24.9 minutes), the mean distance traveled during collection (Mean = 159 meters), and the rate of travel during collection (Mean = 32.3 minutes per 100 meters). The FOC was often not installed during hours of darkness due to potential damage caused by animals and to preclude damage by vehicular traffic. This resulted in no time data for 13 trials.

4.4.4 Table 4.4.4.1 lists the means for installation, distance traveled, and rate of travel for each week of the test. Table 4.4.4.2 lists the means for collection, distance traveled, and rate of travel for each week of the test. Only installation values for week 5 were affected adversely by extreme values.

4.4.5 Figures 4.4.5.1 and 4.4.5.2 show the box and whisker plots for installation and collection of the FOC by week of the test. The crews improved their techniques slightly for installing the FOC after week 5. Crewmen learned how to avoid kinking the cable and how to better handle the cable reels. The crews were consistent in their conduct of collecting the FOC cables. Generally, there appeared to be more pressure on the crewmen to collect the FOC prior to roadmarch than for installation after RPV battery emplacement.

Table 4.4.3.1. Overall Descriptive Statistics for FOC Installation Time, Distance Traveled, and Rate of Travel

5_CTA0083 FROM 87018 TO 87087
INSTALL THE FIBER OPTICS CABLES

CONN_MIN SCORES > 100 DELETED

UNIVARIATE

VARIABLE=CONN_MIN CONNECTION*TIME(Min)

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	50	SUM WGTS	50	100% MAX	43.9167	99%	43.9167	2.85	30.8167
MEAN	19.219	SUM	960.95	75% Q3	25.3542	95%	38.225	3.9	32.9667
STD DEV	9.11037	VARIANCE	82.9989	50% MED	17.7833	90%	30.735	4.4	38.15
SKEWNESS	0.530736	KURTOSIS	0.177851	25% Q1	13.5125	10%	7.44166	6.51667	38.3167
USS	22535.4	CSS	4066.94	0% MIN	2.85	5%	4.175	7.35	43.9167
CV	47.4029	STD MEAN	1.2884			1%	2.85		
T:MEAN=0	14.9169	PROB>|T|	0.0001	RANGE	41.0667				
SGN RANK	637.5	PROB>|S|	0.0001	Q3-Q1	11.8417				
NUM ^= 0	50			MODE	15				
W:NORMAL	0.968692	PROB<W	0.388						

VARIABLE=CONDIST DISTANCE

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	75	SUM WGTS	75	100% MAX	800	99%	800	50	460
MEAN	161.573	SUM	12118	75% Q3	257	95%	466	50	460
STD DEV	156.748	VARIANCE	24569.9	50% MED	92	90%	409	50	490
SKEWNESS	1.64581	KURTOSIS	2.70846	25% Q1	50	10%	50	50	540
USS	3776118	CSS	1818172	0% MIN	50	5%	50	50	800
CV	97.0135	STD MEAN	18.0997			1%	50		
T:MEAN=0	8.92686	PROB>|T|	0.0001	RANGE	750				
SGN RANK	1425	PROB>|S|	0.0001	Q3-Q1	207				
NUM ^= 0	75			MODE	50				
D:NORMAL	0.238294	PROB>D	<0.01						

VARIABLE=CONNRATE CONNECTION* RATE(MIN/100M)

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	49	SUM WGTS	49	100% MAX	76.6333	99%	76.6333	0.956522	48.7333
MEAN	23.0403	SUM	1128.97	75% Q3	35.4167	95%	58.5999	1.41667	50
STD DEV	17.9406	VARIANCE	321.866	50% MED	20	90%	48.7333	1.96358	55.5667
SKEWNESS	0.864965	KURTOSIS	0.327104	25% Q1	8.37273	10%	2.22054	2	61.6333
USS	41461.4	CSS	15449.6	0% MIN	0.956522	5%	1.69012	2.22054	76.6333
CV	77.8664	STD MEAN	2.56294			1%	0.956522		
T:MEAN=0	8.98976	PROB>|T|	0.0001	RANGE	75.6768				
SGN RANK	612.5	PROB>|S|	0.0001	Q3-Q1	27.0439				
NUM ^= 0	49			MODE	30				
W:NORMAL	0.919874	PROB<W	<0.01						

Table 4.4.3.2. Overall Descriptive Statistics for FOC Stowage Time, Distance Traveled, and Rate of Travel

5_CTA0083 FROM 87018 TO 87087
STOW THE FIBER OPTICS CABLES

UNIVARIATE

VARIABLE=COLL_MIN COLLECTION*TIME(Min)

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	64	SUM WGTS	64	100% MAX	92.9	99%	92.9	5.96667	55.0167
MEAN	24.8995	SUM	1593.57	75% Q3	29.0125	95%	60.8791	7	57.7167
STD DEV	15.9902	VARIANCE	255.686	50% MED	21.3	90%	40.9999	8.03333	61.9333
SKEWNESS	2.24283	KURTOSIS	6.36325	25% Q1	15.0417	10%	10.5	8.98333	80.35
USS	55787.2	CSS	16108.2	0% MIN	5.96667	5%	8.27083	10	92.9
CV	64.2189	STD MEAN	1.99877			1%	5.96667		
T:MEAN=0	12.4574	PROB>|T|	0.0001	RANGE	86.9333				
SGN RANK	1040	PROB>|S|	0.0001	Q3-Q1	13.9708				
NUM ^= 0	64			MODE	10				
D:NORMAL	0.164297	PROB>D	<0.01						

VARIABLE=DISTANCE DISTANCE*FROM GCS*TO RGT (m.)

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	77	SUM WGTS	77	100% MAX	800	99%	800	50	460
MEAN	158.675	SUM	12218	75% Q3	254.5	95%	463	50	460
STD DEV	155.7	VARIANCE	24242.4	50% MED	73	90%	405	50	490
SKEWNESS	1.68131	KURTOSIS	2.89749	25% Q1	50	10%	50	50	540
USS	3701118	CSS	1842423	0% MIN	50	5%	50	50	800
CV	98.1247	STD MEAN	17.7436			1%	50		
T:MEAN=0	8.94266	PROB>|T|	0.0001	RANGE	750				
SGN RANK	1501.5	PROB>|S|	0.0001	Q3-Q1	204.5				
NUM ^= 0	77			MODE	50				
D:NORMAL	0.242595	PROB>D	<0.01						

VARIABLE=COLLRATE COLLECTION* RATE(MIN/100M)

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	64	SUM WGTS	64	100% MAX	160.7	99%	160.7	1.74638	70
MEAN	32.2638	SUM	2064.88	75% Q3	44.525	95%	104.025	2.03704	86
STD DEV	30.4695	VARIANCE	928.388	50% MED	27.8832	90%	67.8333	2.77778	110.033
SKEWNESS	1.93798	KURTOSIS	5.07977	25% Q1	7.73904	10%	3.85573	3.625	123.867
USS	125109	CSS	58488.5	0% MIN	1.74638	5%	2.98958	3.69565	160.7
CV	94.4385	STD MEAN	3.80868			1%	1.74638		
T:MEAN=0	8.47112	PROB>|T|	0.0001	RANGE	158.954				
SGN RANK	1040	PROB>|S|	0.0001	Q3-Q1	36.786				
NUM ^= 0	64			MODE	29.8667				
D:NORMAL	0.158275	PROB>D	<0.01						

Table 4.4.4.1. FOC Installation Mean Time, Distance and Rate of Travel by Week of the Test

5_CTA0083 FROM 87018 TO 87087
INSTALL THE FIBER OPTICS CABLES

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK1: 18-24 JAN									
CONN_MIN	CONNECTION*TIME(Min)	6	24.05	8.92	15.00	38.15	3.64	144.32	79.56
CONDIST	DISTANCE	7	183.43	274.05	50.00	800.00	103.58	1284.00	75100.95
CONNRATE	CONNECTION* RATE(MIN/100M)	5	25.33	14.26	2.00	40.00	6.38	126.63	203.38
WEEK=WK2: 25-31 JAN									
CONN_MIN	CONNECTION*TIME(Min)	6	21.15	12.79	10.00	43.92	5.22	126.90	163.61
CONDIST	DISTANCE	10	182.40	142.86	50.00	490.00	45.18	1824.00	20409.82
CONNRATE	CONNECTION* RATE(MIN/100M)	6	12.56	6.26	2.59	20.00	2.55	75.36	39.15
WEEK=WK3: 1-7 FEB									
CONN_MIN	CONNECTION*TIME(Min)	3	24.36	6.39	17.42	30.00	3.69	73.08	40.86
CONDIST	DISTANCE	8	228.00	138.14	50.00	378.00	48.84	1824.00	19083.14
CONNRATE	CONNECTION* RATE(MIN/100M)	3	19.35	13.85	8.13	34.83	8.00	58.06	191.85
WEEK=WK4: 8-14 FEB									
CONN_MIN	CONNECTION*TIME(Min)	5	24.69	10.30	14.33	38.32	4.61	123.47	106.12
CONDIST	DISTANCE	7	84.71	91.85	50.00	293.00	34.71	593.00	8435.57
CONNRATE	CONNECTION* RATE(MIN/100M)	5	44.63	28.00	4.89	76.63	12.52	223.16	783.83
WEEK=WK5: 15-21 FEB									
CONN_MIN	CONNECTION*TIME(Min)	4	113.21	197.30	13.00	409.15	98.65	452.83	38928.15
CONDIST	DISTANCE	6	141.83	115.53	50.00	291.00	47.16	851.00	13346.97
CONNRATE	CONNECTION* RATE(MIN/100M)	4	221.04	398.27	12.87	818.30	199.13	884.18	158618.66
WEEK=WK6: 22-28 FEB									
CONN_MIN	CONNECTION*TIME(Min)	2	13.34	7.18	8.27	18.42	5.07	26.68	51.51
CONDIST	DISTANCE	4	230.50	208.58	50.00	421.00	104.29	922.00	43507.00
CONNRATE	CONNECTION* RATE(MIN/100M)	2	19.40	24.66	1.96	36.83	17.43	38.80	607.95
WEEK=WK7: 1-7 MAR									
CONN_MIN	CONNECTION*TIME(Min)	11	14.23	7.97	2.85	27.78	2.40	156.50	63.48
CONDIST	DISTANCE	12	136.92	156.81	50.00	460.00	45.27	1643.00	24590.45
CONNRATE	CONNECTION* RATE(MIN/100M)	11	21.98	18.24	0.96	55.57	5.50	241.77	332.87
WEEK=WK8: 8-14 MAR									
CONN_MIN	CONNECTION*TIME(Min)	6	17.37	8.95	3.90	28.93	3.65	104.23	80.14
CONDIST	DISTANCE	9	129.78	158.45	50.00	540.00	52.82	1168.00	25107.69
CONNRATE	CONNECTION* RATE(MIN/100M)	6	17.93	16.71	3.70	48.53	6.82	107.58	279.19

Table 4.4.4.1. FOC Installation Mean Time, Distance and Rate of Travel by Week of the Test (Cont.)

5_CTA0083 FROM 87018 TO 87087
INSTALL THE FIBER OPTICS CABLES

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK9: 15-21 MAR									
CONN_MIN	CONNECTION*TIME(Min)	7	20.58	8.30	7.35	32.97	3.14	144.08	68.97
CONDIST	DISTANCE	10	183.50	145.42	50.00	439.00	45.99	1835.00	21148.28
CONNRATE	CONNECTION* RATE(MIN/100M)	7	22.25	17.91	2.22	48.73	6.77	155.74	320.65
WEEK=WK10: 22-28 MAR									
CONN_MIN	CONNECTION*TIME(Min)	1	18.00	.	18.00	18.00	.	18.00	.
CONDIST	DISTANCE	3	74.67	42.72	50.00	124.00	24.67	224.00	1825.33
CONNRATE	CONNECTION* RATE(MIN/100M)	1	36.00	.	36.00	36.00	.	36.00	.

Table 4.4.4.2. FOC Stowage Mean Time, Distance, and Rate of Travel by Week of Test

5_CTA0083 FROM 87018 TO 87087
STOW THE FIBER OPTICS CABLES

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK1: 18-24 JAN									
COLL_MIN	COLLECTION*TIME(Min)	8	21.05	11.24	7.00	39.00	3.97	168.38	126.26
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	8	166.75	258.07	50.00	800.00	91.24	1334.00	66597.64
COLLRATE	COLLECTION* RATE(MIN/100M)	8	25.25	16.92	3.63	56.00	5.98	202.01	286.28
WEEK=WK2: 25-31 JAN									
COLL_MIN	COLLECTION*TIME(Min)	8	24.78	7.35	12.00	33.10	2.60	198.25	54.02
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	10	182.40	142.86	50.00	490.00	45.18	1824.00	20409.82
COLLRATE	COLLECTION* RATE(MIN/100M)	8	27.85	25.54	3.88	66.00	9.03	222.78	652.52
WEEK=WK3: 1-7 FEB									
COLL_MIN	COLLECTION*TIME(Min)	6	18.29	7.06	10.00	30.00	2.88	109.72	49.85
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	8	228.00	138.14	50.00	378.00	48.84	1824.00	19083.14
COLLRATE	COLLECTION* RATE(MIN/100M)	6	13.63	11.42	2.78	34.60	4.66	81.77	130.43
WEEK=WK4: 8-14 FEB									
COLL_MIN	COLLECTION*TIME(Min)	5	21.14	10.86	11.23	34.83	4.86	105.72	117.98
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	7	84.71	91.85	50.00	293.00	34.71	593.00	8435.57
COLLRATE	COLLECTION* RATE(MIN/100M)	5	38.56	26.94	3.83	69.67	12.05	192.80	726.01
WEEK=WK5: 15-21 FEB									
COLL_MIN	COLLECTION*TIME(Min)	5	33.86	27.35	13.97	80.35	12.23	169.32	748.14
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	6	141.83	115.53	50.00	291.00	47.16	851.00	13346.97
COLLRATE	COLLECTION* RATE(MIN/100M)	5	55.09	64.82	4.87	160.70	28.99	275.44	4201.64
WEEK=WK6: 22-28 FEB									
COLL_MIN	COLLECTION*TIME(Min)	2	42.02	18.38	29.02	55.02	13.00	84.03	338.00
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	4	230.50	208.58	50.00	421.00	104.29	922.00	43507.00
COLLRATE	COLLECTION* RATE(MIN/100M)	2	58.63	72.69	7.24	110.03	51.40	117.27	5283.64
WEEK=WK7: 1-7 MAR									
COLL_MIN	COLLECTION*TIME(Min)	11	24.90	15.18	8.03	61.93	4.58	273.93	230.33
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	12	136.92	156.81	50.00	460.00	45.27	1643.00	24590.45
COLLRATE	COLLECTION* RATE(MIN/100M)	11	40.37	36.96	1.75	123.87	11.14	444.03	1365.89
WEEK=WK8: 8-14 MAR									
COLL_MIN	COLLECTION*TIME(Min)	8	17.33	7.70	5.97	26.15	2.72	138.67	59.23
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	9	129.78	158.45	50.00	540.00	52.82	1168.00	25107.69
COLLRATE	COLLECTION* RATE(MIN/100M)	8	25.69	16.17	2.04	46.00	5.72	205.52	261.42

Table 4.4.4.2. FOC Stowage Mean Time, Distance, and Rate of Travel by Week of Test (Cont.)

5_CTA0083 FROM 87010 TO 87087
STOW THE FIBER OPTICS CABLES

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK9: 15-21 MAR									
COLL_MIN	COLLECTION*TIME(Min)	9	35.02	25.17	15.53	92.90	8.39	315.20	633.47
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	10	183.50	145.42	50.00	439.00	45.99	1835.00	21148.28
COLLRATE	COLLECTION* RATE(MIN/100M)	9	29.17	18.59	6.03	61.97	6.23	262.55	349.17
WEEK=WK10: 22-28 MAR									
COLL_MIN	COLLECTION*TIME(Min)	2	15.17	0.01	15.17	15.18	0.01	30.35	0.00
DISTANCE	DISTANCE*FROM GCS*TO RGT (m.)	3	74.67	42.72	50.00	124.00	24.67	224.00	1825.33
COLLRATE	COLLECTION* RATE(MIN/100M)	2	30.35	0.02	30.33	30.37	0.02	60.70	0.00

Figure 4. 5.1. Box and whisker plots for FOC installation by week of the test.

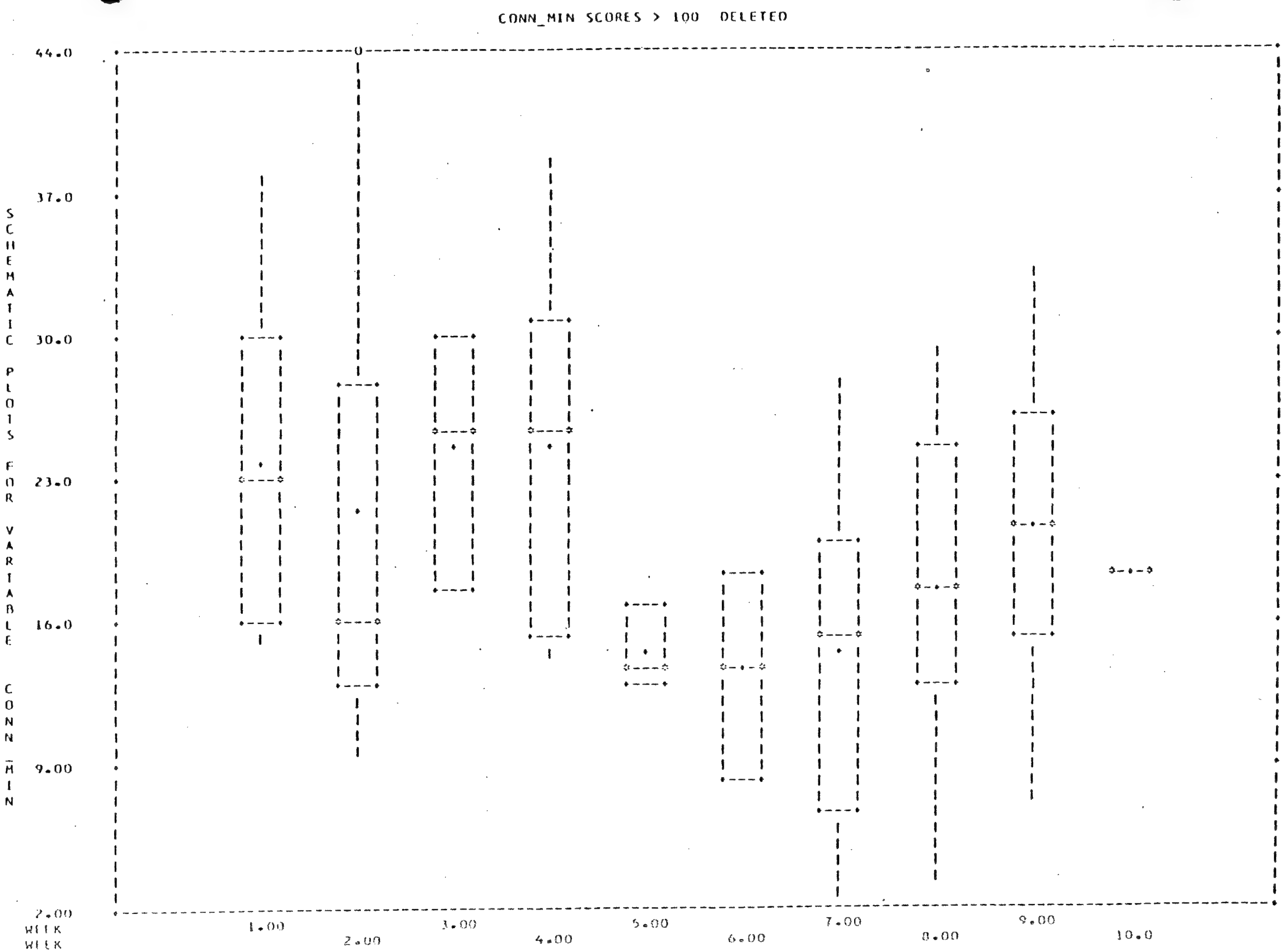
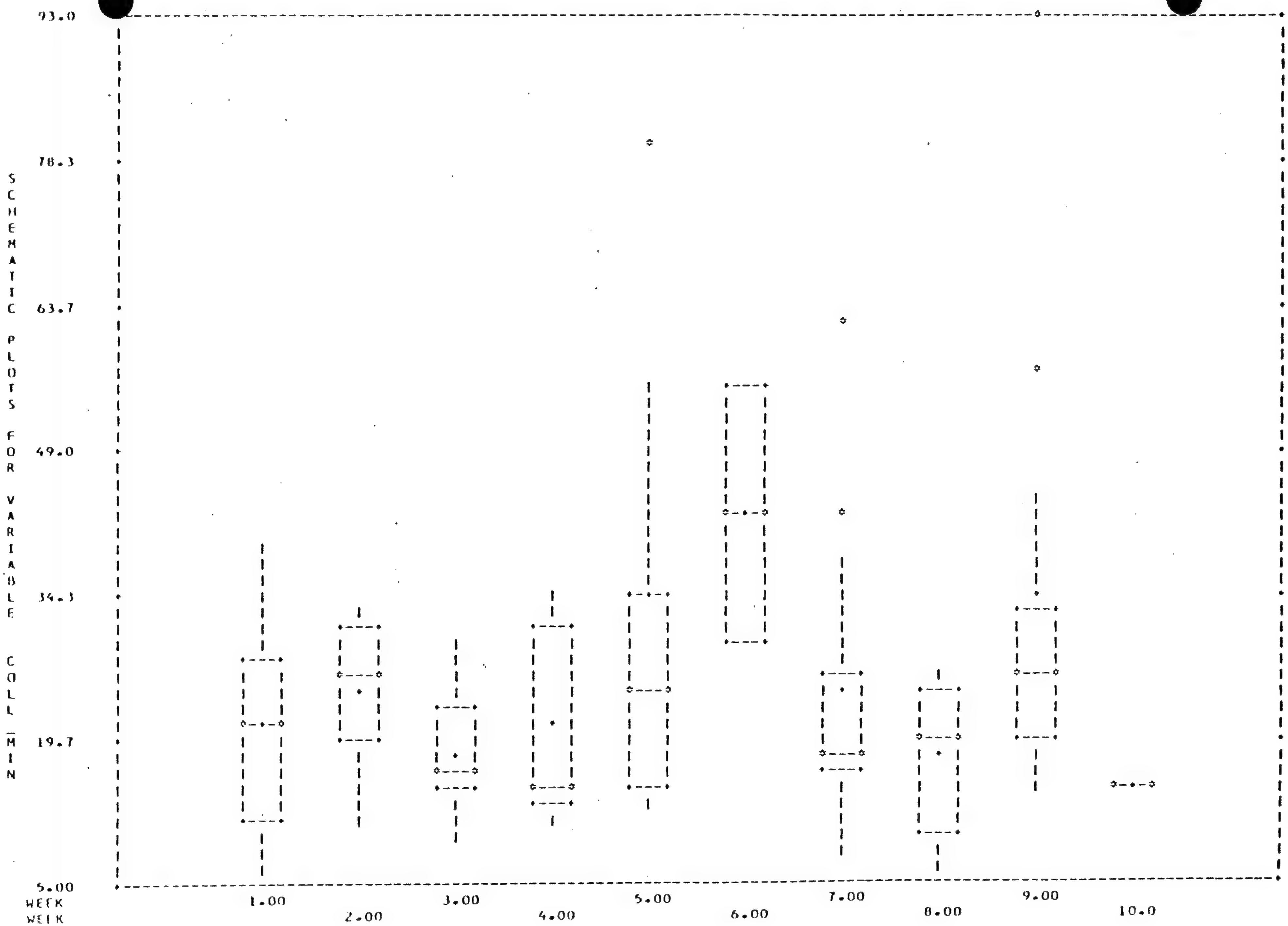


Figure 4.4.5.2. Box and whisker plots for FOC stowing by week of test.



4.4.6 Factors affecting 5_CTA0083 Install/stow fiber optics cables:

A. Procedural Changes

1. Procedures varied depending on situation and between FCS and CLRS.

2. The FO cables were often not laid at night to avoid damage by animals and to preclude vehicular traffic.

3. At the FCS, both cables were run from FCS to the RGT. At the CLRS, one cable was run from the RGT to GCS, and the other cable from the GCS.

4. Technical manual procedures lack credibility for crewmen.

5. The mission commander's truck is used to lay cables and in some cases the cables are man-carried for deployment in others. The implication of this variance for efficiency is not known (see Training Implications).

B. Potential Errors

1. Inadvertent cable disconnect at RGT or GCS because cable connections are external to the vehicles and are not well protected. Friction coupling method is employed and the mass of the cable connector is greater than this method can accommodate. There is no positive connector lock mechanism on either the RGT or the GCS. The service loop technique does not provide sufficient protection and the coiled, stiff cables are a tripping hazard.

2. Improperly seating the FO connectors can cause pin bending or assembly damage.

3. Kinks in cable during its laying can cause breaks in cable under tension due to the characteristics of the cable material.

4. Cables can be laid too close together and be susceptible to simultaneous damage from explosives.

C. Training Implications

Deployment procedures as outlined in technical manuals require more time than crews find practical and procedures are altered to fit emplacement circumstances. Implications of the overall consequence of deviation in procedures are not always understood by the crewmen. For example, the FO cable reel can be dismounted from the mission commander's truck allowing two-man manual deployment without the truck. This is generally faster and frees the truck driver for other task participation. The difference in the deployment methods is that deploying manually involves pulling the FO cables into place and using the truck involves laying them in place. The implication is that damage to the cable is more likely to occur (covering abrasions, rips, kinks, and tension breaks) using the manual method. Each procedural deviation needs to be investigated for potential equipment design implications or the need for more indepth training or procedural modifications.

D. Maintenance

FO cables are designated for Depot (Mfr) level repair only. The only operational level maintenance allowed is wrapping abrasions and rips in cable covering. Otherwise, only replacement is authorized, requiring additional spares to be carried into the field.

E. Potential Solutions

Perhaps a wheeled cart or dolly designed for use on rough terrain could be provided for manual deployment of the FO cables.

4.5 6_CTA0004 Locate and align RGT

4.5.1 The task of locating and aligning the RGT was performed by the PADS survey team and timed measures for crew conduct of the task were unavailable.

4.5.2 Procedural reference:

a. DEP 55-1550-200-CL-4 pages N-4 through N-5
b. TM 55-1505-200

4.5.3 Factors affecting 6_CTA0004 Locate and align RGT:

A. Procedural Considerations

1. The location and alignment of the RGT is critical to mission performance. The procedures for location and alignment need to be fully understood and followed.

2. Refine RGT alignment procedures for sets 1, 2, and 3.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. PADS information, if incorrect, will result in AV position reporting errors;

2. Inputting the incorrect data into the RIM panel; and

3. Aligning the RGT with the azimuth of an incorrect landmark.

C. Training Implications

1. Training for operators should stress the critical importance of accurately orienting the RGT over the survey stake and deriving the Orientation Line (OL) and the End of the Orientation Line (EOL).

2. Stress verification of survey data before use. Additional training may be needed such as the use of polar and rectangular data verification procedures. This also includes plotting techniques.

D. Human Engineering Considerations

When initializing the RGT, a crewman must climb up to the scope to obtain the angles and then climb down to read the initializer panel when readouts are obscured by sunlight. The process is time consuming.

4.6 7_CTA0074 Power up GCS

4.6.1 The task of powering up and activating the GCS was a subtask of 1_CTA0012 Emplacement of GCS. A timed measure of this task was considered redundant and not collected.

4.6.2 Procedural reference:

a. DEP 55-1550-200-CL-1 pages N-2 through N-4
b. TM 55-1550-200

4.6.3 Factors affecting 7_CTA0074 Power-up and activate GCS:

A. Procedural Considerations

1. Following the prescribed procedures typically does not require the participation of the entire three-man crew.

2. The master circuit breakers are located at the front of the GCS requiring crewmen to walk through the GCS in the dark to use the switches for power-up. This impacts the time to power-up and is a safety hazard.

B. Potential Errors

1. Inadvertent crossing of power cables from generator number one and generator number two could cause excessive diagnostic time if there is a power loss.

2. MIM codes are obtained from CEOI and punched into the console at the rear of the GCS. The operator cannot verify the codes after entry. This makes errors hard to detect and diagnose.

C. Human Engineering Considerations

1. Voltage meter readings on the generator and GCS input panels often do not match. The meter on the GCS input power panel may require a greater sensitivity and reliability. The GCS meter reading should have precedence over the generator meter reading.

2. The main power panel is located at the opposite end of the GCS from the door, requiring passage through the entire length of the GCS to get to it.

3. Communications cables are not adequately labeled and inconsistent numbering is used in schematics and hookup diagrams. This creates problems in unhooking defective equipment and activating repaired elements in the communications system.

D. Potential Solutions

1. Consideration should be given to redesigning the internal layout of the GCS to eliminate or minimize the space and personnel movement problems.

2. Moving the main power distribution panel to the wall by the entrance door would eliminate some personnel movement problems.

4.7 8_CTA0096 and 9_CTA0100 Prepare recovery subsystem for recovery and Deploy recovery subsystem barrier support structure.

4.7.1 The critical tasks 8_CTA0096 Prepare recovery subsystem for recovery and 9_CTA0100 Deploy recovery subsystem barrier support structure were related and overlapping time measures. Due to the nature of the crew tasks, many of the preparation procedures were conducted while the barrier was being deployed. Deploying the barrier structure was a timed measure within the greater time measure of preparing the recovery subsystems. Both overlapping measures were required in order to understand the tasks.

4.7.2 Procedural reference:

a. DEP-55-1550-CL-6 pages N-2 through N-5
b. TM 55-1550-200

4.7.3 The preparation timed measure began after the RV was emplaced. The timed measure ended after the GCS acknowledged that the recovery vehicle was ready for recovery. The deployment of the barrier timed measure began when the crewmen attached the recovery net. The timed measure ended when the GCS acknowledged that the recovery vehicle was ready to recover.

4.7.4 Table 4.7.4 lists the overall descriptive statistics for 8_CTA0096 Prepare recovery subsystem for recovery and 9_CTA0100 Deploy recovery subsystem barrier support structure. The full preparation of recovery vehicle (Median = 27.8 minutes) required more time than did the deployment of the barrier structure (Median = 7.3 minutes). The difference between the two measures (Median difference = 20.5 minutes) provides an indication of the time required for preparation procedures other than those used to deploy the barrier structure.

4.7.5 Tables 4.7.5.1 and 4.7.5.2 list the mean times to prepare the recovery vehicle and deploy the barrier structure by week of the test, respectively. Mean times to prepare the recovery vehicle for recovery increased during the latter weeks of the test (Means: week 7 = 51.5 minutes; week 8 = 42.7 minutes; and week 9 = 45.4 minutes). A similar trend was found for times to deploy the barrier structure.

4.7.6 Figures 4.7.6.1 and 4.7.6.2 show the box and whisker plots for preparation of the recovery vehicle and deployment of the barrier structure, respectively. The trends during the weeks 7, 8, and 9 were ones of increasing times to conduct the preparation of the recovery vehicle while similar trends did not develop for deployment of the barrier structure. Crewmen reported that the increased number of missions during the three-week period lead to increased vehicle problems detected during checkout and to the fatigue of the crew. Conducting the task of deploying the barrier appeared to become more consistent and less time consuming during the same period.

4.7.7 Figures 4.7.7.1 and 4.7.7.2 show the box and whisker plots for preparing the recovery vehicle and deploying the barrier support structure by first, middle, and last trials of the day. The first trials of the day required more time (Mean = 51.1 minutes, N=35) than did the middle and last trials of the day (Mean, middle = 32.6 minutes, N=26; Mean, last = 28.0 minutes, N=19). Factors complicating the first trials included having to lay two landlines (communications and RGA), remove stowed equipment, shifts in position of cables after roadmarch, and problems detected during vehicle checkout after road-march.

Table 4.7.4. Overall Descriptive Statistics for Preparing the Recovery Subsystem and Deploying the Barrier Structure

8_CTA0096 FROM 87018 TO 87087
PREPARE RECOVERY SUBSYSTEM FOR RECOVERY OPERATIONS

TOT_MIN SCORES > 150 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	80	SUM WGTS	80
MEAN	39.6402	SUM	3171.22
STD DEV	34.2054	VARIANCE	1170.01
SKEWNESS	1.52747	KURTOSIS	1.52024
USS	218138	CSS	92430.8
CV	86.2897	STD MEAN	3.82428
T:MEAN=0	10.3654	PROB>|T|	0.0001
SGN RANK	1620	PROB>|S|	0.0001
NUM ¬= 0	80		
D:NORMAL	0.207979	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	140.467	99%	140.467
75% Q3	47.05	95%	119.792
50% MED	27.8083	90%	103.023
25% Q1	16.0125	10%	7.99833
0% MIN	3.96667	5%	6.49167
		1%	3.96667
RANGE	136.5		
Q3-Q1	31.0375		
MODE	112.4		

EXTREMES

LOWEST	HIGHEST
3.96667	119.333
5.5	119.817
5.73333	133.417
6.46667	134.9
6.96667	140.467

9_CTA0100 FROM 87018 TO 87087
DEPLOY RECOVERY SUBSYSTEM BARRIER SUPPORT STRUCTURE

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	81	SUM WGTS	81
MEAN	8.82181	SUM	714.567
STD DEV	5.59357	VARIANCE	31.2881
SKEWNESS	1.8022	KURTOSIS	3.52237
USS	8806.82	CSS	2503.05
CV	63.4062	STD MEAN	0.621508
T:MEAN=0	14.1942	PROB>|T|	0.0001
SGN RANK	1660.5	PROB>|S|	0.0001
NUM ¬= 0	81		
D:NORMAL	0.175068	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	29.35	99%	29.35
75% Q3	10.4583	95%	22.965
50% MED	7.26667	90%	15.9233
25% Q1	5.49167	10%	4.19
0% MIN	0.35	5%	2.90333
		1%	0.35
RANGE	29		
Q3-Q1	4.96667		
MODE	7.71667		

EXTREMES

LOWEST	HIGHEST
0.35	22.8
1.76667	22.9833
2.6	25.2
2.83333	27.25
3.53333	29.35

Table 4.7.5.1. Mean Times to Prepare the Recovery Subsystem for Recovery by Week of the Test

B_CTA0096 FROM 87018 TO 87087
PREPARE RECOVERY SUBSYSTEM FOR RECOVERY OPERATIONS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	14	35.34	54.41	3.97	219.53	14.54	494.70	2960.12	153.97
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	33.02	33.23	5.50	134.90	9.22	429.22	1104.31	100.65
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	33.84	27.20	14.90	86.28	11.10	203.05	739.88	80.38
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	28.97	18.48	12.22	65.02	7.54	173.80	341.38	63.79
WEEK=WK5: 15-21 FEB									
TOT_MIN	3	13.12	5.63	7.53	18.80	3.25	39.35	31.74	42.95
WEEK=WK6: 22-28 FEB									
TOT_MIN	2	28.65	6.34	24.17	33.13	4.48	57.30	40.20	22.13
WEEK=WK7: 1-7 MAR									
TOT_MIN	19	51.47	41.05	7.87	140.47	9.42	977.90	1684.95	79.75
WEEK=WK8: 8-14 MAR									
TOT_MIN	9	52.66	42.66	6.47	133.42	14.22	473.95	1820.22	81.02
WEEK=WK9: 15-21 MAR									
TOT_MIN	10	69.57	45.43	11.63	154.18	14.36	695.67	2063.47	65.30

Table 4.7.5.2. Mean Times to Deploy the Barrier Structure by Week of the Test

9_CTA0100 FROM 87018 TO 87087
DEPLOY RECOVERY SUBSYSTEM BARRIER SUPPORT STRUCTURE

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	14	12.11	7.66	4.10	29.35	2.05	169.48	58.61	63.24
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	9.26	6.29	2.60	27.25	1.74	120.38	39.54	67.91
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	6.90	2.31	3.72	9.87	0.94	41.40	5.34	33.49
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	7.90	4.79	0.35	13.37	1.96	47.40	22.96	60.65
WEEK=WK5: 15-21 FEB									
TOT_MIN	3	4.89	1.79	2.83	5.97	1.03	14.68	3.19	36.48
WEEK=WK6: 22-28 FEB									
TOT_MIN	2	8.42	0.34	8.18	8.67	0.24	16.85	0.12	4.06
WEEK=WK7: 1-7 MAR									
TOT_MIN	18	8.37	6.28	1.77	25.20	1.48	150.70	39.49	75.06
WEEK=WK8: 8-14 MAR									
TOT_MIN	9	7.99	3.85	4.25	16.15	1.28	71.88	14.82	48.20
WEEK=WK9: 15-21 MAR									
TOT_MIN	10	8.18	3.12	5.00	14.62	0.99	81.78	9.71	38.10

Figure 4.7.6.1. Box and whisker plots for preparation of the recovery vehicle.

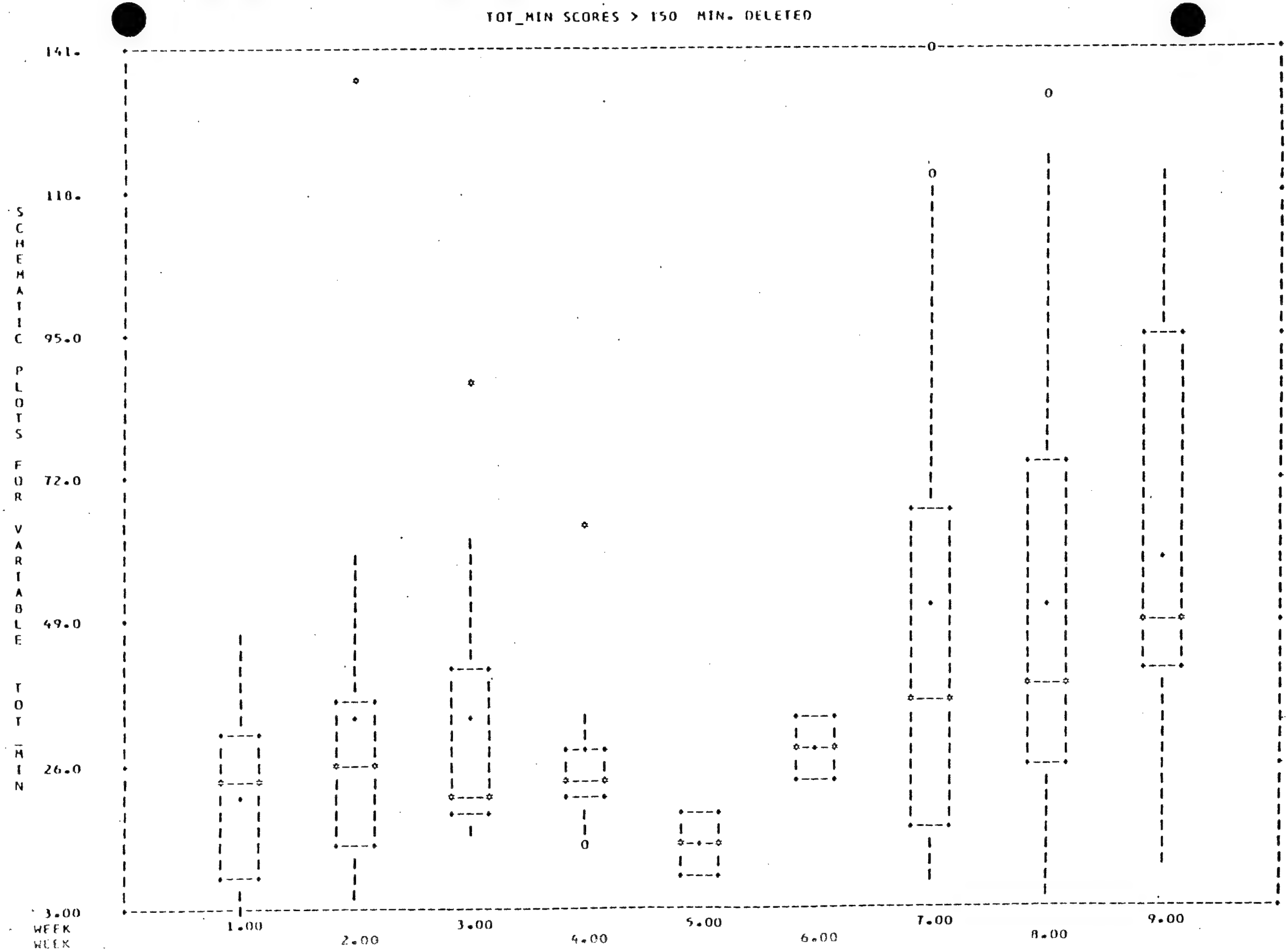


Figure 4.7.6.2. Box and whisker plots for deployment of the barrier structure.

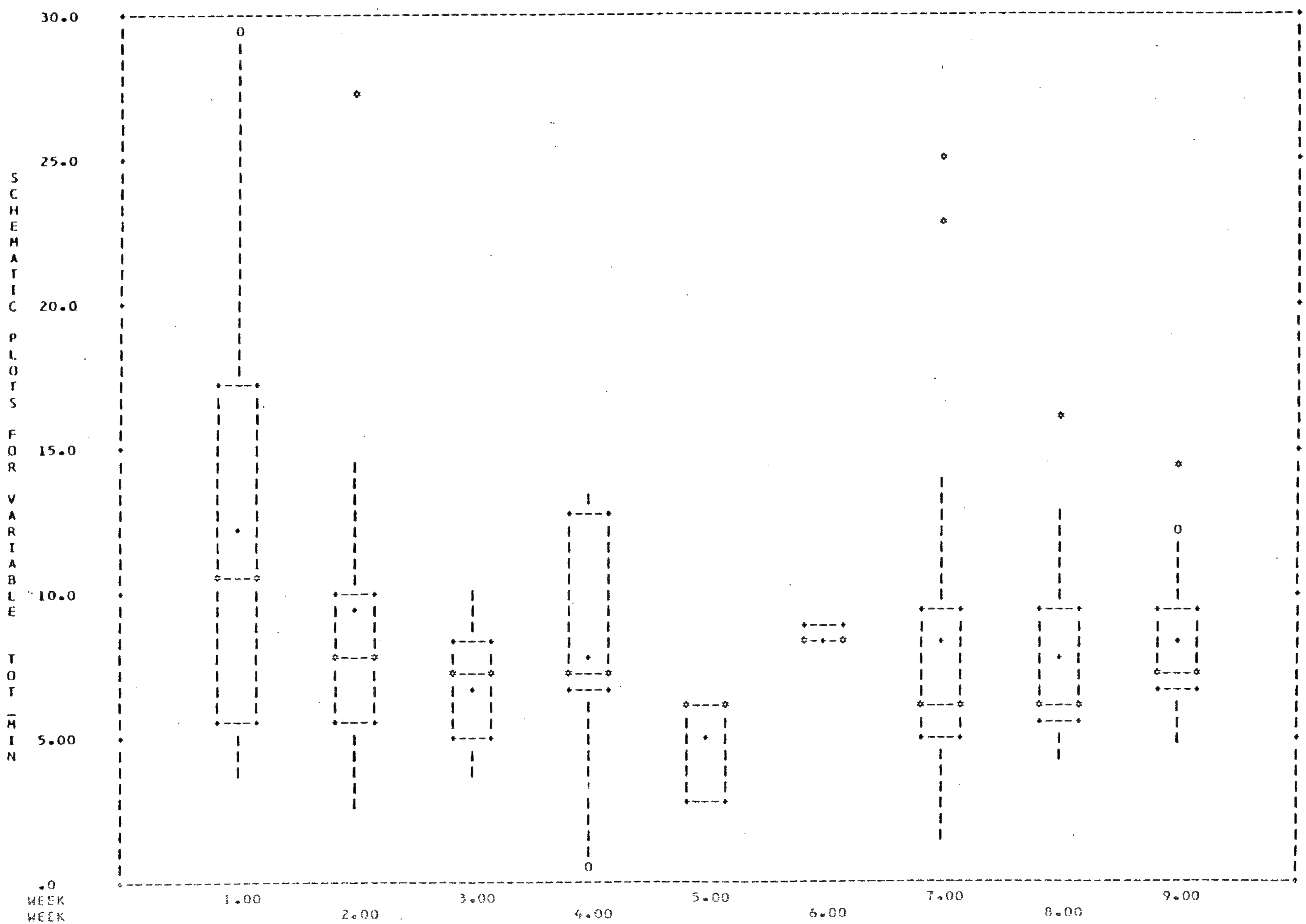


Figure 4.[illegible]1. Box and whisker plots for preparing the recovery subsystem by first, middle, and last trial[illegible] of the day.

TOT_MIN SCORES > 150 MIN. DELETED

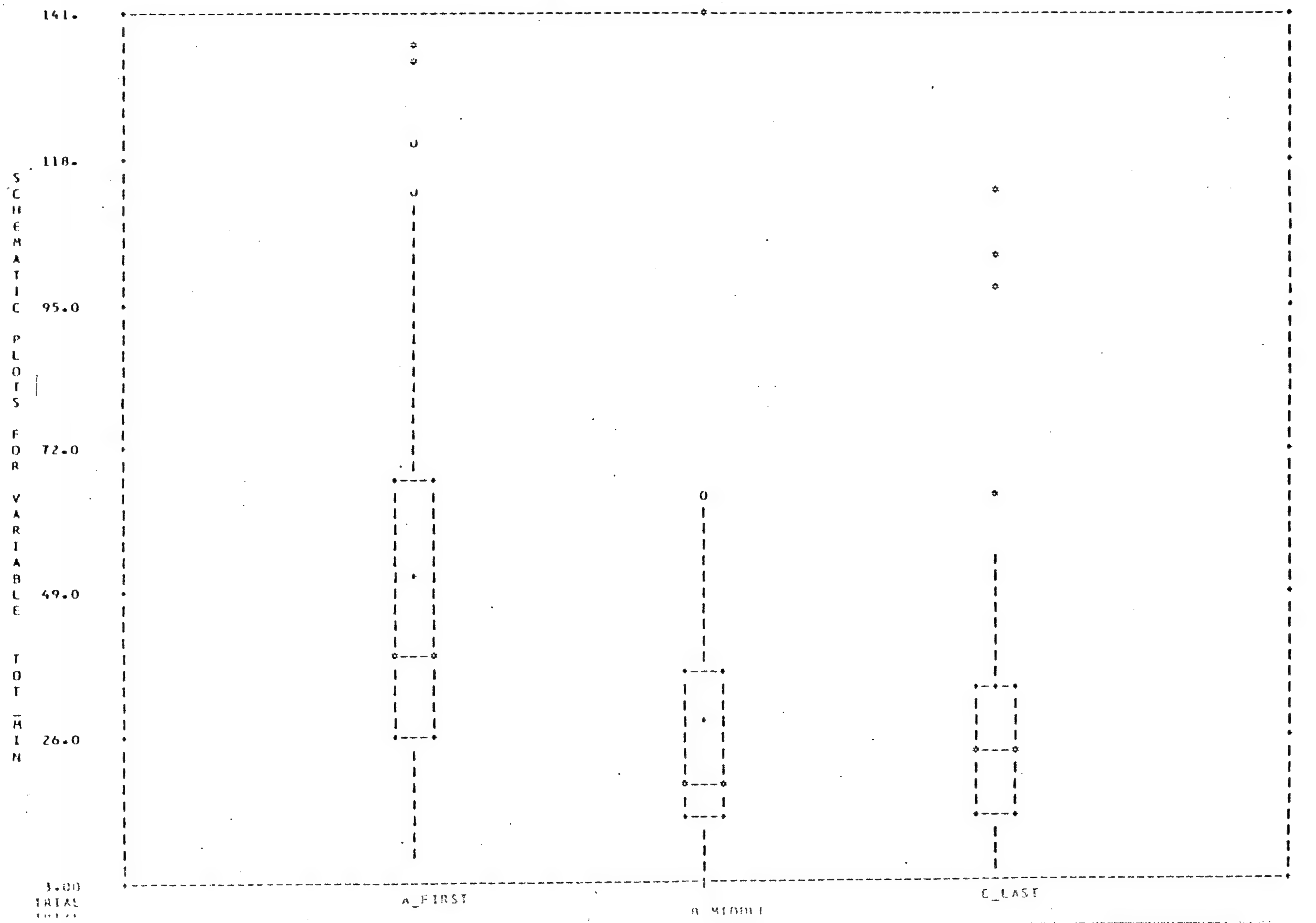
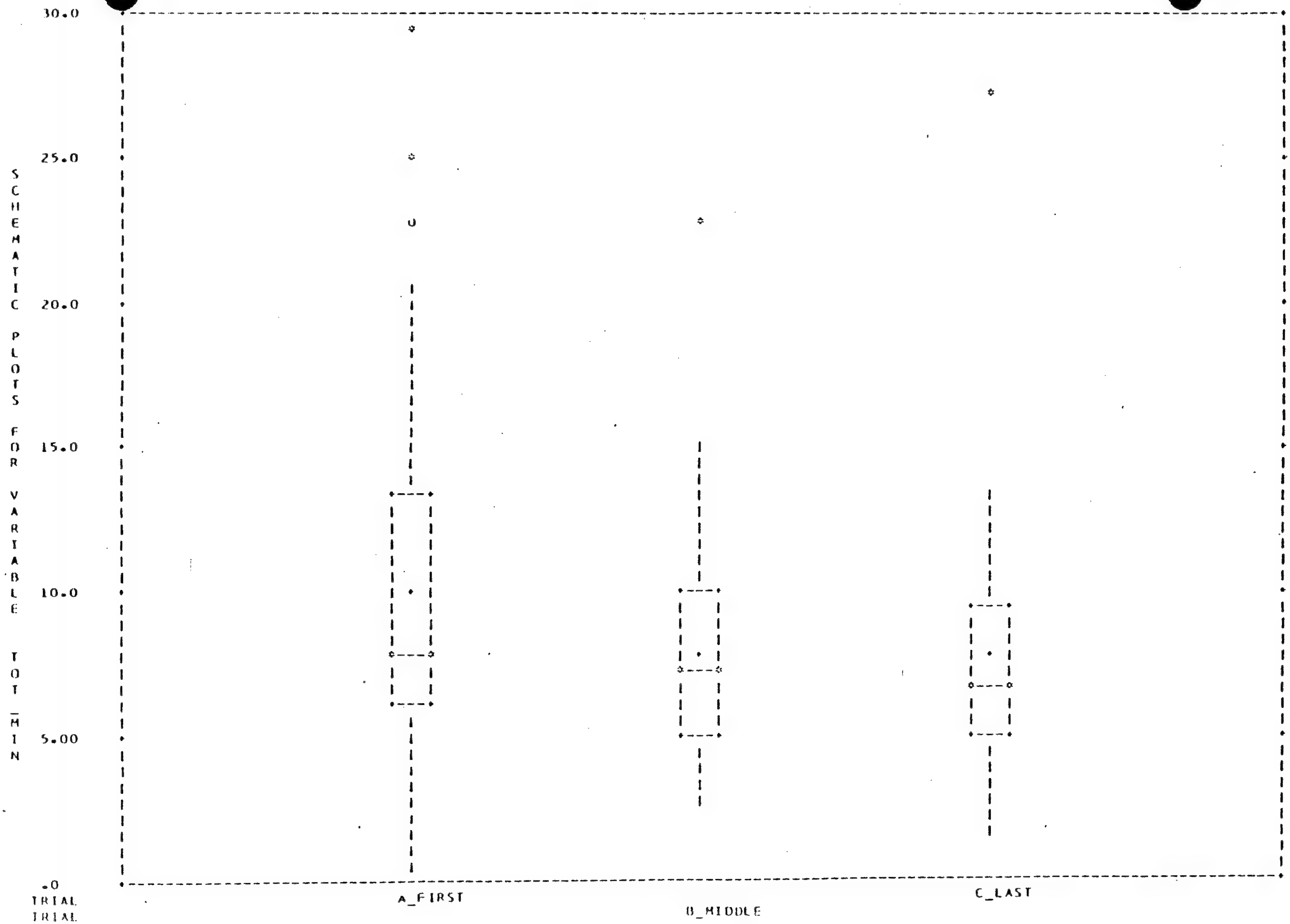


Figure 4.7.7.2. Box and whisker plots for deployment of the barrier structure by first, middle, and last trials of the day



4.7.8 Factors affecting 8_CTA0096 Prepare recovery subsystem for recovery:

A. Procedural Changes

1. RGA camera alignment procedures do not always ensure proper camera alignment. Relationships among camera, recovery arms, and glide slope cannot easily be verified in a timely manner at the recovery vehicle. An improved system and/or new procedures indicating precise positive alignment is required. Currently, RGA meters are hard to use in making fine leveling adjustments.

2. The procedural checklists provided in the technical manuals are not as complete and comprehensive as they need to be. For example, camera alignment verification.

3. The recovery pallet power cable (28 vdc) is generally left installed during moves. Procedures call for it to be removed, but this is usually unnecessary. Switches located on the RGA panel are provided for 28 vdc power control.

4. Hydraulic pressure diagnostic gauges (high and low pressure gauges) are not a permanent part of the recovery system. It is possible to connect the low pressure gauge to the high pressure fitting. Low pressure gauge mechanism will not support the pressures present here and will result in a line or gauge failure. A health and safety hazard exists here as well as the potential for damage to equipment. High pressure connected to low pressure will not provide a reading but is not a hazard.

4.7.9 Factors affecting 9_CTA0100 Deploy recovery subsystem barrier support structure:

A. Procedural Considerations

Deploying the subsystem barrier and inspecting the routing of cables in darkness will be difficult and time consuming.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Failure of crewmen or ground observers to ensure that pulleys, cables, the net, etc., are free and properly positioned to prevent equipment damage;

2. Failure to ensure that the net is properly connected before attempting to deploy;

3. Failure to ensure that the truck engine is at the proper RPM for maintaining hydraulic pressure at the required level;

4. Failure to remove barrier clamp;

5. Failure to level the RGA camera;

6. Failure to remove the RGA lens cap;

7. Failure to check recovery net tension;

8. Failure to set brake pressure to ensure system is operational;

9. Failure to select the proper detent position based on wind direction and velocity; and

10. Failure to connect RGA wire at both ends.

C. Training Implications

The training of the need for aware observers needs to be stressed.

D. Human Engineering Considerations

1. The brake pressure gauge for the cable drum is located in the rear of the left side control box and is difficult to read.

2. The comments made in <u>CTA0011 Emplacement of recovery subsystem</u> apply here as well and are not repeated.

E. Safety/Health Hazard

1. The cable gaff hook pole must be handled with caution, especially when used in the dark.

2. The safety guardrail for the operator's control platform is loose and causes crewmen to lose their balance.

F. Potential Solutions

1. A means, either electromechanical or observational, should be added to inform the operator when the barrier is fully extended or retracted. The sounds from the hydraulics may be severely attenuated by ambient noise, especially if the operator is in MOPP IV gear.

2. A more substantial set of safety rails or chains should be designed to protect the operator from falls while deploying or retracting the barrier.

3. The #4 hydraulic control levers could be locked together to ensure equal traversing of both sides of the structure so that premature opening of the net is not possible.

4. Easily readable, permanently emplaced index marks for detent positions should be added that can be readily identified day or night.

5. A built-in, high pressure reducer should be considered for the pressure measurement point that would enable both high and low hydraulic pressures to be measured with a single gauge. This would reduce the number of gauge required and the likelihood of improper hookup.

6. A "tell tail" wind direction indicator device located high on the recovery vehicle would facilitate crew checks of wind direction.

7. A color coded RGA lens cap or a sensor and warning that the cap has not been removed would help avoid a time-consuming error.

4.8 10_CTA0102 and 11_CTA0016 Remove AV from container to AV support stand and Move AV from support stand to launch subsystem.

4.8.1 The tasks 10_CTA0102 and 11_CTA0016 Remove AV from container to AV support stand and Move AV from support stand to launch subsystem were not conducted as described in technical manuals or training literature. Shortcuts and streamlining of procedures were implemented by crewmen, such as transferring the AV directly from the AVH to launcher, unpacking AVs several hours prior to transfer, and fueling or defueling the AV when it was convenient. Therefore, the two tasks must be analyzed together in order to better understand the tasks.

4.8.2 Procedural reference:

a. DEP 55-1550-200-CL-8 pages N-6 through N-9
b. TM 55-1550-200

4.8.3 The timed measure for removing the AV began when the first latch of the shipping container was opened. The timed measure stopped when the AV was placed on the support stand and was disconnected from the crane. The timed measure for moving the AV began when the air vehicle lift (AVL) was attached to the AV. The timed measure ended when the AVL was detached and stored.

4.8.4 Table 4.8.4 lists the overall descriptive statistics for removing the AV from the container to the AV support stand and for moving the AV from the support stand to the launch subsystem. The median time to perform both tasks was very similar (Median, remove = 5.58 minutes; Median, move = 5.18 minutes).

4.8.5 Tables 4.8.5.1 and 4.8.5.2 list the mean times to perform both tasks by week of the test. Table 4.8.5.1 for week 4 lists a small sample size (N=7), an extreme value (Maximum value = 165 minutes), and a large mean (Mean = 49.7 minutes). Table 4.8.5.2 for week 4 also lists a small sample size (N=7), an extreme value (Maximum value = 56.45 minutes), and a large mean (Mean = 14.96 minutes).

4.8.6 Figures 4.8.6.1 and 4.8.6.2 show the bar and whisker plots for both tasks. Figure 4.8.6.1 indicates that crew performance times to remove the AV from the container to the AV support stand increased slightly in the latter weeks of the test. However, median times (asterisks with dashed line) remained consistent. The number of single asterisks for this task indicates trials where unlatching of the container and assembling the AV began prior to the need to transfer the AV. The advanced preparation shortened the time required for the hoisting and transfer of the AV. Figure 4.8.6.2 indicates that the crew performance for moving the AV from the AV support stand to the launch subsystem was consistent, with the exception of week 4.

4.8.7 Figure 4.8.7 shows the trials for moving the AV from the support stand to the launch subsystem by first, middle, and last trials of the day. First trials required more time (Mean, first = 7.1 minutes, N=36) than did later trials (Mean, middle = 5.1 minutes, N=36; Mean, last = 5.3 minutes, N=31). A similar pattern was present for removal of the AV from the container to the support stand (Mean, first = 9.9 minutes, N=37; Mean, middle = 7.9 minutes, N=50; and Mean, last = 5.9 minutes, N=33).

Table 4.8.4. Overall Descriptive Statistics for Transfer of the AV from Container to Launcher

10_CTA0102 FROM 87018 TO 87087
REMOVE AV FROM CONTAINER TO AV SUPPORT STAND

TOT_MIN SCORES > 100 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
N	120	SUM WGTS	120	100% MAX	42.4	99%	42.134	LOWEST	HIGHEST
MEAN	7.99222	SUM	959.067	75% Q3	10	95%	25.9867	0.633333	26.6833
STD DEV	8.31804	VARIANCE	69.1898	50% MED	5.58333	90%	17.2683	0.916667	38.1667
SKEWNESS	2.34874	KURTOSIS	6.25716	25% Q1	2.4	10%	1.76833	1.15	40.2667
USS	15898.7	CSS	8233.58	0% MIN	0.633333	5%	1.46667	1.2	41.1333
CV	104.077	STD MEAN	0.75933			1%	0.692833	1.45	42.4
T:MEAN=0	10.5254	PROB>|T|	0.0001	RANGE	41.7667				
SGN RANK	3630	PROB>|S|	0.0001	Q3-Q1	7.6				
NUM ^= 0	120			MODE	4				
D:NORMAL	0.189155	PROB>D	<0.01						

11_CTA0016 FROM 87018 TO 87087
MOVE AV FROM AV SUPPORT STAND TO LAUNCH SUBSYSTEM

TOT_MIN SCORES > 50 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
N	103	SUM WGTS	103	100% MAX	16.9333	99%	16.8593	LOWEST	HIGHEST
MEAN	5.86311	SUM	603.9	75% Q3	6.61667	95%	12.0667	1.33333	12.0833
STD DEV	2.77788	VARIANCE	7.71664	50% MED	5.18333	90%	10.03	2.08333	12.9167
SKEWNESS	1.75044	KURTOSIS	3.65181	25% Q1	4.08333	10%	3.37333	2.56667	15.0333
USS	4327.83	CSS	787.098	0% MIN	1.33333	5%	2.91667	2.78333	15.0833
CV	47.3791	STD MEAN	0.273713			1%	1.36333	2.86667	16.9333
T:MEAN=0	21.4206	PROB>|T|	0.0001	RANGE	15.6				
SGN RANK	2678	PROB>|S|	0.0001	Q3-Q1	2.53333				
NUM ^= 0	103			MODE	3.81667				
D:NORMAL	0.161234	PROB>D	<0.01						

Table 4.8.5.1. Mean Times to Remove the AV from the Container

10_CTA0102 FROM 87018 TO 87087
REMOVE AV FROM CONTAINER TO AV SUPPORT STAND

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	23	3.74	3.84	0.63	18.33	0.80	86.03	14.75	102.69
WEEK=WK2: 25-31 JAN									
TOT_MIN	15	4.62	5.40	0.92	17.83	1.40	69.33	29.20	116.91
WEEK=WK3: 1-7 FEB									
TOT_MIN	10	4.32	4.94	1.45	14.50	1.56	43.25	24.37	114.14
WEEK=WK4: 8-14 FEB									
TOT_MIN	7	49.72	73.77	1.90	165.08	27.88	348.07	5442.24	148.36
WEEK=WK5: 15-21 FEB									
TOT_MIN	8	14.34	11.79	4.37	42.40	4.17	114.73	138.90	82.18
WEEK=WK6: 22-28 FEB									
TOT_MIN	5	6.91	5.04	2.27	14.08	2.25	34.53	25.37	72.92
WEEK=WK7: 1-7 MAR									
TOT_MIN	27	9.56	7.30	1.87	41.13	1.41	258.25	53.34	76.36
WEEK=WK8: 8-14 MAR									
TOT_MIN	14	12.42	10.89	3.00	40.27	2.91	173.88	118.69	87.72
WEEK=WK9: 15-21 MAR									
TOT_MIN	13	11.20	11.65	1.58	38.17	3.23	145.63	135.81	104.03

Table 4.8.5.2. Mean Time to Move the AV from the Support Stand to the Launcher

II_CTA0016 FROM 87018 TO 87087
MOVE AV FROM AV SUPPORT STAND TO LAUNCH SUBSYSTEM

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	15	6.43	2.39	3.72	10.40	0.62	96.48	5.70	37.13
WEEK=Wk2: 25-31 Jan									
TOT_MIN	15	6.14	2.96	1.33	12.08	0.76	92.03	8.77	48.27
WEEK=Wk3: 1-7 Feb									
TOT_MIN	7	4.83	2.76	2.08	10.05	1.04	33.80	7.60	57.10
WEEK=Wk4: 8-14 Feb									
TOT_MIN	7	14.96	18.92	3.13	56.45	7.15	104.72	357.89	126.46
WEEK=Wk5: 15-21 Feb									
TOT_MIN	4	6.17	1.68	3.97	8.05	0.84	24.68	2.82	27.19
WEEK=Wk6: 22-28 Feb									
TOT_MIN	3	4.84	1.37	3.37	6.08	0.79	14.52	1.88	28.37
WEEK=Wk7: 1-7 Mar									
TOT_MIN	24	6.07	3.12	3.38	15.08	0.64	145.60	9.71	51.37
WEEK=Wk8: 8-14 Mar									
TOT_MIN	16	4.98	1.20	2.87	7.12	0.30	79.72	1.43	24.01
WEEK=WK9: 15-21 MAR									
TOT_MIN	13	5.29	2.58	2.57	12.92	0.71	68.80	6.64	48.67

Figure 4.[illegible].1. Box and whisker plots for removal of the AV from container to AV support stand.

TOT_MIN SCORES > 100 MIN. DELETED

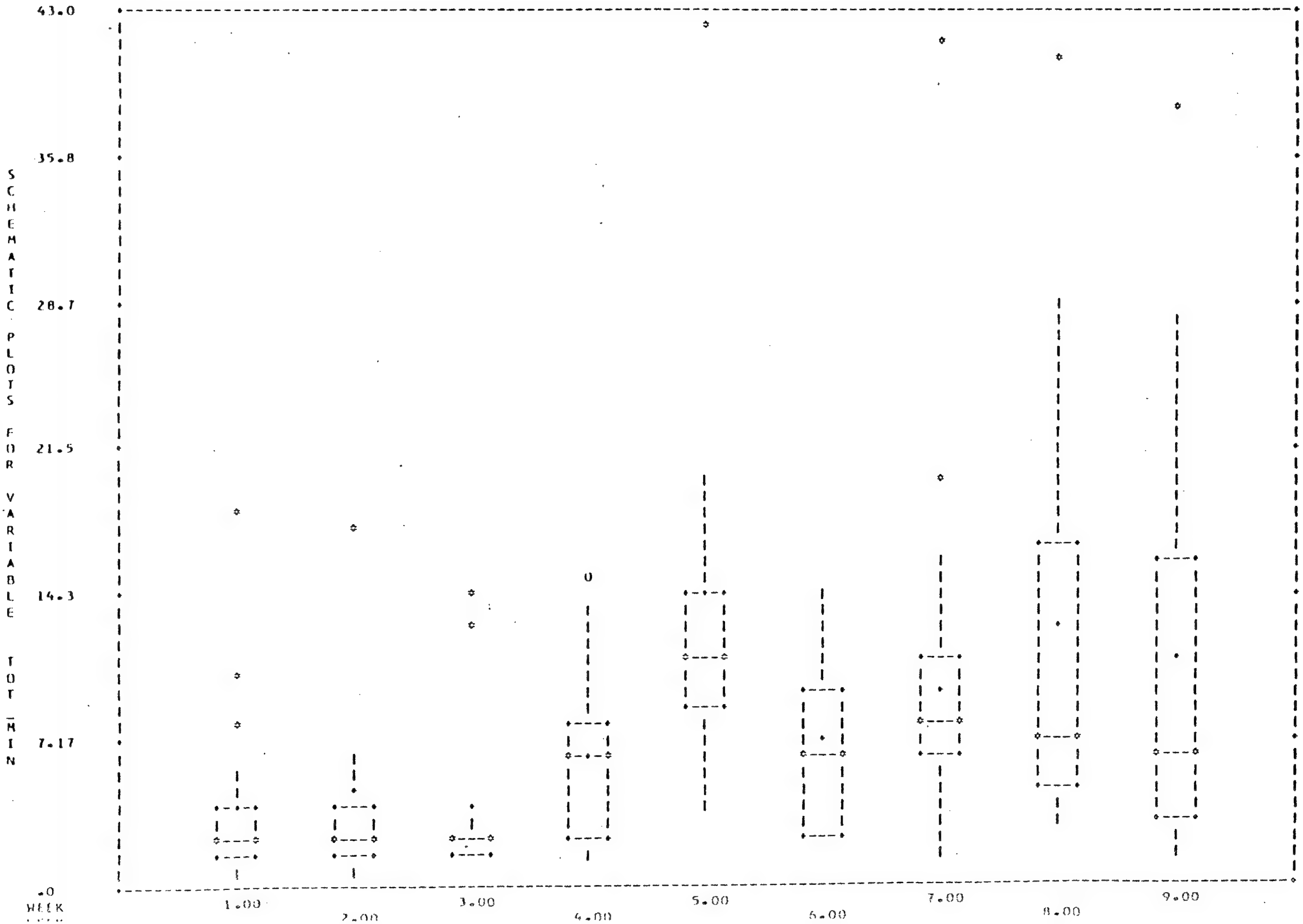


Figure 4.8 2. Box and whisker plots for move of the AV support stand to launch subsystem.

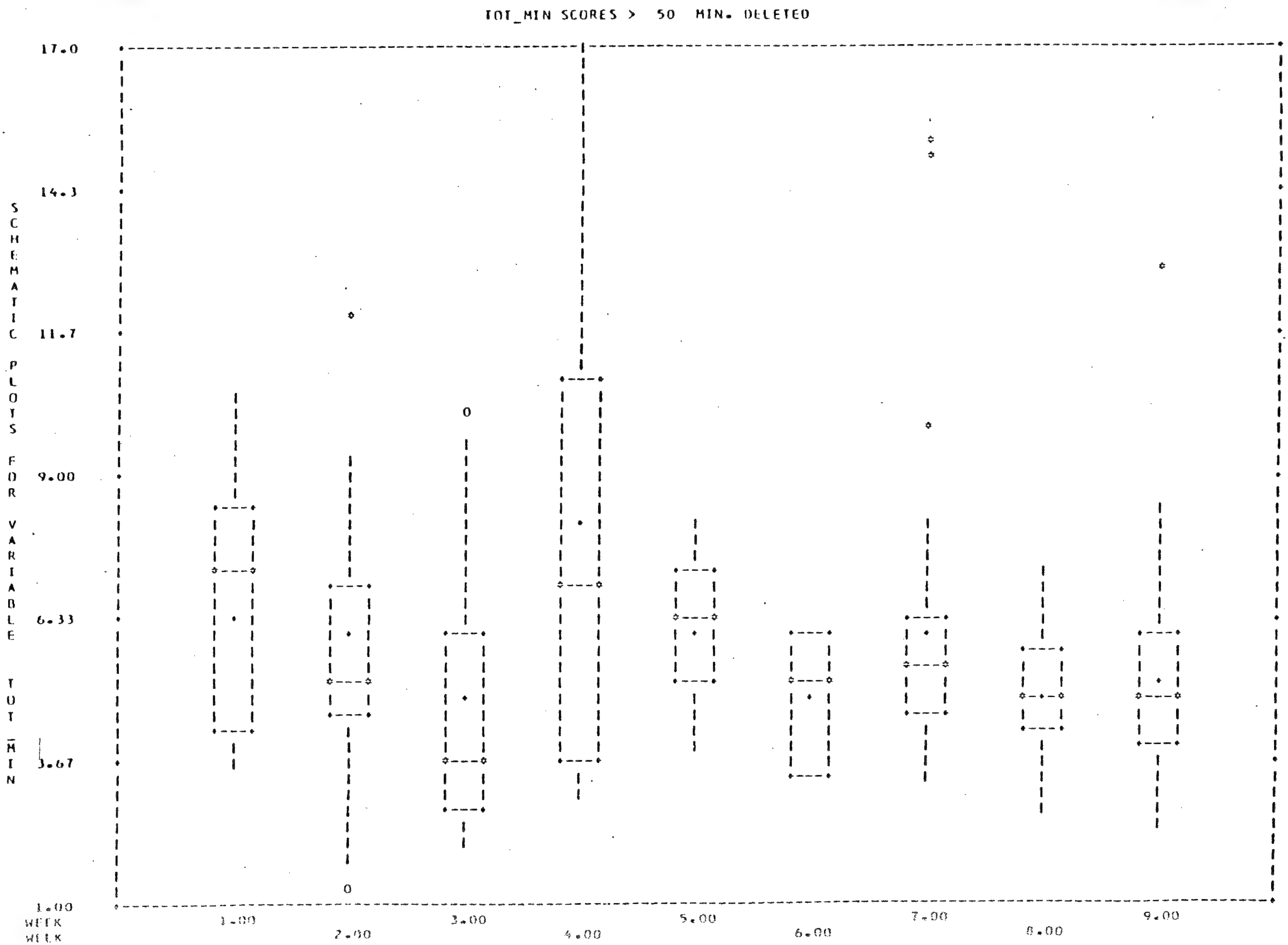
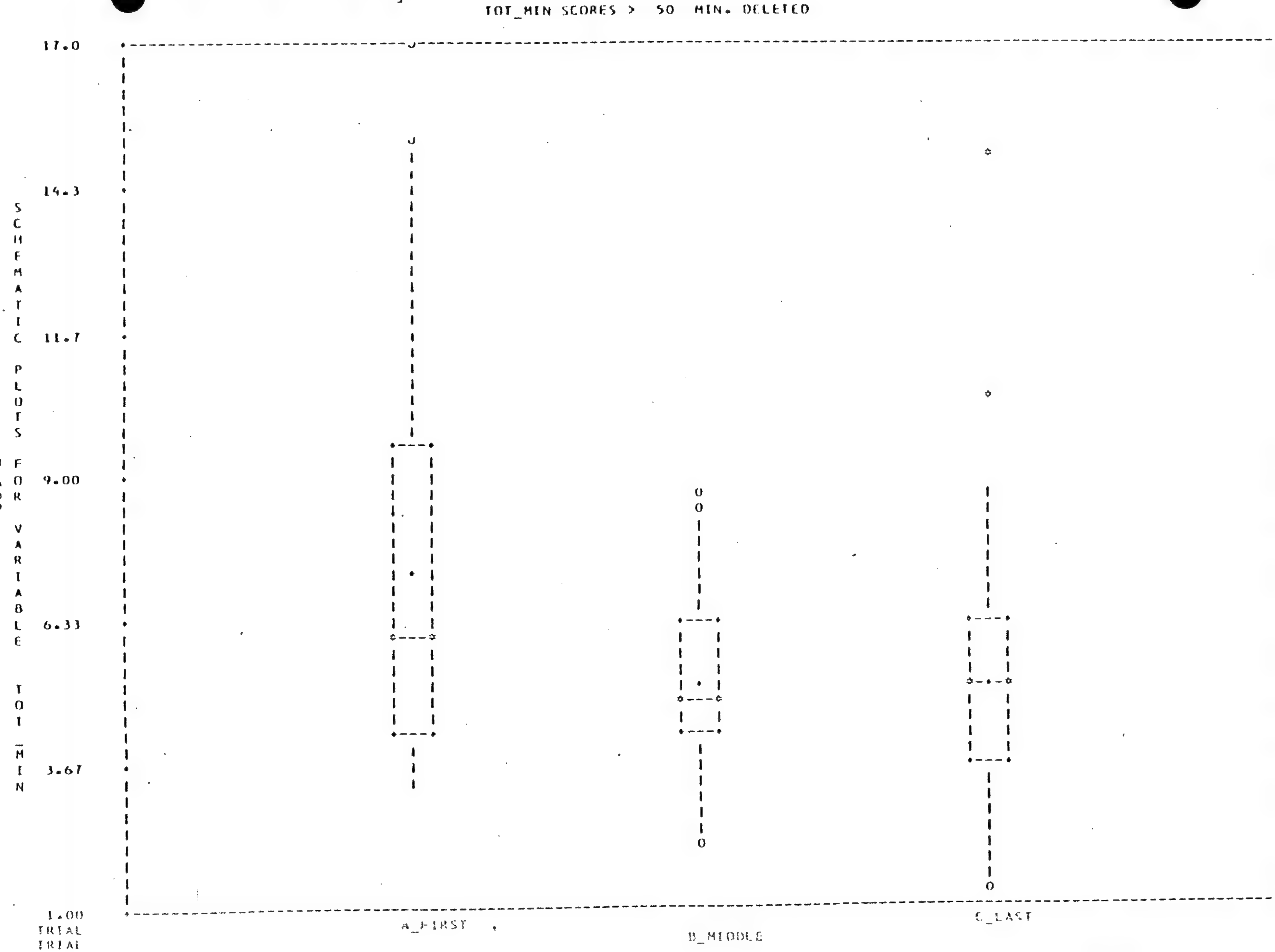


Figure 4.8.7. Box and whisker plots for move of the AV from AV support stand to launch subsystem by first, middle, and last trials of the day.



4.8.8 Factors affecting 10_CTA0102 Remove AV from container to AV support stand:

A. Procedural Considerations

1. AV was fueled on both the AVH and the LV, in addition to the mandated procedure of fueling it on the support stand.

2. AV was occasionally moved directly from container to LV rather than from container to support stand to LV as indicated in the procedures.

3. Crewmen typically anticipate a second mission or malfunction of an AV on the LV and prepare a second AV and have it in a ready standby condition. This procedure may impact on hasty evacuation procedures.

B. Potential Errors

When moving the AV from the AVH directly, the launch vehicle and air vehicle handler trucks are often inappropriately positioned in relation to each other, facing in opposite directions. In these cases, the AV handler truck's exhaust pipe is blowing noxious exhaust fumes into the work area of the operating crewmen. This condition also creates a potential sparking hazard when fuel is spilled on the surfaces of the AV or LV.

C. Training Implications

1. Crewmen need to be trained to evaluate the conditions of wear on the cables used on the AVH crane. These cables have broken under load. Damage to equipment could occur or personnel injury could occur.

2. The consequences of misdirection in the placement of LV and AVH need to be stressed during training sessions.

D. Manpower Implications

When utilizing the AVH as a transport vehicle to take an AV to the maintenance shelter or to retrieve a parachute AV recovery, it is not available for use by launch and recovery crews. The driver and his assistant are also removed as an available manpower resource for launch and recovery operations.

E. Human Engineering Considerations

1. Removing the lids from the storage containers is more difficult than need be. Latches are weak and get damaged. Weight of lids may be greater than is necessary for adequate protection of the AV in transit.

2. Workspace on the AVH is limited and is inadequate for the operators to work.

3. The AV stand assembly pins and connectors are difficult to insert and remove.

4. The height of the AV cradle is too low for comfortable and continued servicing of the AV. The crewmen must bend over and work in unnatural body positions, resulting in muscle fatigue and possible strain injury.

5. There is no tool for inserting the wing retainer pins on the AV. Currently, crewmen must use any available means, e.g., tent pegs, screwdrivers, pliers, flashlights, etc. A special tool, or at least a soft mallet, should be provided for this purpose.

F. Safety/Health Hazard

1. Safety in handling the container lids needs to be stressed. The safety envelope for personnel working around the crane when handling lids needs to be specified and operators trained to be aware of potentially hazardous conditions.

2. The comments made in Training Implications regarding cable wear apply here also.

3. AV container lids have been lifted over crewmen's heads. A safety envelope needs to be defined and operators trained to be aware of it.

4. The crane sling cables are frequently damaged and frayed. The sling cables have broken and AV container lids have been dropped. The AV is also lifted using the sling cables.

5. The lower AV loader crane transit holder on the LV has sharp edges that have injured operators. This transit holder serves no purpose other than to hold a microswitch. It could be elimintded by placing the microswitch at the crane pivot point.

6. Fuel spillage on the AVH poses a potential fire hazard.

7. Personnel jump between vehicles or straddle the separation between vehicles when moving an AV between the AVH and the LV. The potential for injuries is high.

G. Equipment Design

1. The latches on the AV container lids were judged by several operators to be too fragile for field use. They get damaged and become hard to open. There are approximately 30 latches used on the AV containers. Fewer latches and a better securing method would accommodate the crewmen more beneficially.

2. The AV stand was judged to be less durable than it needs to be. It is susceptible to warping and some spot welds were found to be broken.

3. To allow adequate working space, the AV container lids must be placed on the ground after the container is opened. The sealing gaskets become dirty or damaged and prevent resealing.

4. The AV sling hooks are difficult to engage because of unnecessarily close tolerances in mating parts.

5. Protective stowage for cable slings to prevent fraying or kinking needs to be provided. Additional slings may be required. Criteria for sling repair or placement need to be established.

6. The fuel service pump has numerous design problems, including:

(a) Sight gauge is difficult to read in its low position.
(b) Pump plungers fail frequently.
(c) Crewmen cannot read the sight gauge while pumping.
(d) Crewmen cannot read the sight gauge at night without using a flashlight.
(e) The location of the pump handle is too low and inconvenient for operator to use.
(f) The general location in which the fuel service pump is placed restricts body movement and is generally in a poor location.
(g) The force required to crank the pump may require more than one person for operation if prolonged pump operation is required.

H. Potential Solutions

The AVH and LV might be equipped with additional folding decks increasing the walkways around the AV and between the AVH and LV.

4.8.9 Factors affecting 11_CTA0016 Move AV from support stand to launch subsystem:

A. Procedural Considerations

Due to the fact that crewmen often remove the AV directly from the container to the LV, all the items in CTA0102 Move AV from container to support stand apply to this task except those directly associated with the container. Only those observations or comments unique to moving the AV from the support stand will be presented here.

B. Potential Errors

1. Air vehicle can be lifted with one or more securing pins still attached to the stand.

2. AV may be hoisted using a frayed cable sling.

C. Training Implications

Hands-on training stressing proper handling of the AV while being moved from the stand is needed to minimize the likelihood of personnel injury or equipment damage.

D. Manpower Implications

Sufficient manpower is available from AVH and LV crews to support this task.

E. Human Engineering Considerations

Excessive finger pressure on controls of the hydraulic crane can cause severe oscillations of the crane if the AV is attached.

F. Safety/Health Hazard

1. In high wind conditions the AV is subject to swinging and turning. Possible hazard to both personnel and equipment.

2. Hoisting the AV using a frayed cable sling may result in the accidental fall of the AV or striking of a crewman.

G. Maintenance

A well defined criterion is needed for repair or replacement of cable slings.

4.9 14_CTA0040 Perform launch operation of AV.

4.9.1 Procedural reference:

a. DEP 55-1550-200-CL-5 pages N-7 through N-9
b. TM 55-1550-200

4.9.2 The timed measure began when the GCS instructed the LV to begin launch operations. The timed measure ended when the AV departed the launcher or an abort occurred.

4.9.3 Table 4.9.3 lists the overall descriptive statistics for 14_CTA0040 Perform launch operation of AV. The median time to launch the AV was short (Median = 9.5 minutes). Other data indicated that there were 105 successful and 122 aborted launch trials analyzed for the task. The mean time for successful launch (Mean = 9.6 minutes) was greater than that for aborted launch (Mean = 8.3 minutes). The perform launch operation required a series of system checks and reports of status from the launch officer to the AVO. The data indicates that the status checks required 8 to 9 minutes to complete.

4.9.4 Table 4.9.4 lists the mean times to perform launch operations of the AV by week of the test. Extreme values were found in weeks 7 and 9 (Maximum values, week 7 = 70.15; week 9 = 19.45). The range of means was small (Mean, highest = 9.61 minutes; Mean, lowest = 8.43 minutes), differing only 1:18 minutes.

4.9.5 Figure 4.9.5 shows the box and whisker plots for performing the launch operation. The crew performance was consistent. The length of the whiskers and the number of asterisks below the boxes indicates the aborts encountered prior to launch. The number of aborted launches might be reduced by following the suggestions given in paragraph 4.1.2 for 12_CTA0025 Prelaunch operations.

Table 4.9.3. Overall Descriptive Statistics for Performing Prelaunch Operations

14_CTA0040 FROM 87018 TO 87087
PERFORM LAUNCH OPERATION OF THE AV

TOT_MIN SCORES > 20 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	226	SUM WGTS	226
MEAN	8.9208	SUM	2016.1
STD DEV	1.62822	VARIANCE	2.6511
SKEWNESS	0.315273	KURTOSIS	9.27336
USS	18581.7	CSS	596.498
CV	18.252	STD MEAN	0.108308
T:MEAN=0	82.3653	PROB>|T|	0.0001
SGN RANK	12825.5	PROB>|S|	0.0001
NUM ¬= 0	226		
D:NORMAL	0.219943	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	19.45	99%	13.4654
75% Q3	9.85417	95%	10.2608
50% MED	9.5	90%	10.155
25% Q1	7.5125	10%	7.045
0% MIN	1.66667	5%	6.65083
		1%	3.46483
RANGE	17.7833		
Q3-Q1	2.34167		
MODE	9.5		

EXTREMES

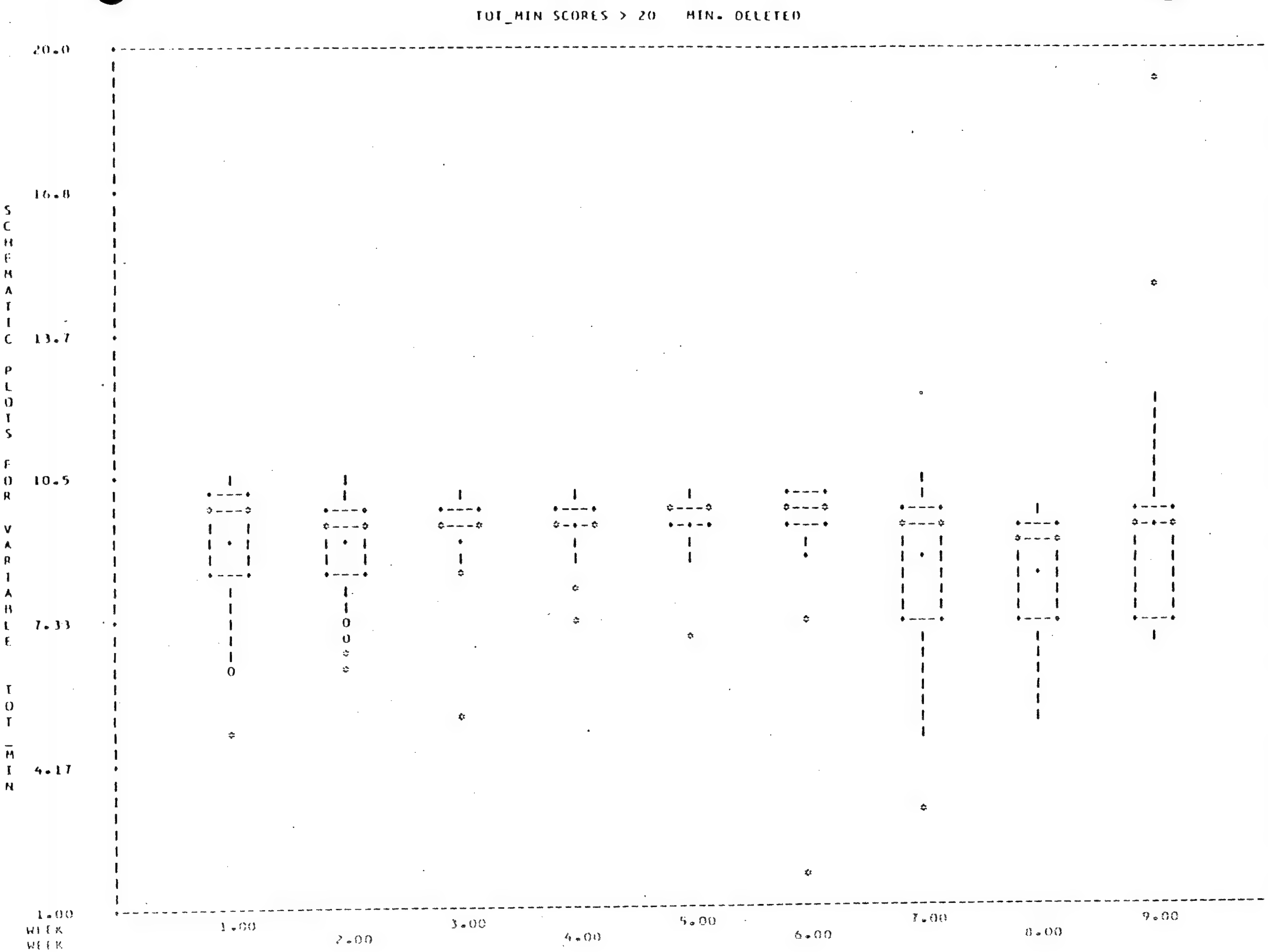
LOWEST	HIGHEST
1.66667	10.45
2.98333	10.4833
4.76667	10.5333
5.35	14.55
5.36667	19.45

Table 4.9.4. Mean Times to Perform Launch Operations

14_CTA0040 FROM 87018 TO 87087
PERFORM LAUNCH OPERATION OF THE AV

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	37	9.17	1.38	4.77	10.53	0.23	339.15	1.91	15.07
WEEK=Wk2: 25-31 Jan									
TOT_MIN	26	8.95	1.18	6.20	10.48	0.23	232.77	1.38	13.13
WEEK=Wk3: 1-7 Feb									
TOT_MIN	11	9.21	1.37	5.35	10.30	0.41	101.33	1.86	14.82
WEEK=Wk4: 8-14 Feb									
TOT_MIN	16	9.38	0.79	7.17	10.22	0.20	150.08	0.63	8.46
WEEK=Wk5: 15-21 Feb									
TOT_MIN	8	9.35	0.97	7.05	10.03	0.34	74.82	0.94	10.38
WEEK=Wk6: 22-28 Feb									
TOT_MIN	10	8.80	2.64	1.67	10.27	0.83	88.05	6.96	29.96
WEEK=Wk7: 1-7 Mar									
TOT_MIN	63	9.61	7.90	2.98	70.15	1.00	605.48	62.43	82.21
WEEK=Wk8: 8-14 Mar									
TOT_MIN	30	8.43	1.30	5.37	9.83	0.24	252.82	1.69	15.44
WEEK=WK9: 15-21 MAR									
TOT_MIN	26	9.30	2.65	6.83	19.45	0.52	241.75	7.04	28.53

Figure 4.9.5. Box and whisker plots for performing launch operations.



4.9.6 Factors affecting 14_CTA0040 Perform launch operation of AV:

A. Procedural Considerations

Note: The relationship between the elements of this task and those associated with <u>CTA0025: Prelaunch operations</u> creates a duplication of observations in some cases.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Failure to adjust the truck engine to proper RPM; and

2. Failure of personnel to locate in a safe area behind the launcher.

C. Training Implications

1. Reasons why truck engine RPM must be maintained and the symptoms appearing in the hydraulic system that result from setting the incorrect RPM should be stressed.

2. Safety procedures provided in the TM should be stressed such as clearing the area of personnel without hearing protection.

3. Operators felt that more hands-on time training should be given for launch operations.

4. Preflight inspection should be rigorously performed by the crewmen prior to launch.

5. Prepare AV for launch, TM DEP 1550-200-10-2, pg 2-256. All warnings and cautions should be condensed under one heading in addition to their present location in the technical manuals. This applies to cautions and warnings throughout the complete RPV series of TMs.

D. Human Engineering Considerations

1. Launch initialization data are input to the MICNS device manually. It would be more efficient if this data were transmitted automatically by computer from the GCS. Manually transferring data into the MICNS device during prelaunch is a time-consuming process and often resulted in input error.

2. The high noise levels generated when the AV is running on the launch rail make verbal transmission of data over the landline difficult for the operator to hear.

3. The operator has to write data onto a plastic overlay form located on the control panel. The data then has to be keyed into the MICNS device. In darkness or under pressure conditions, it is difficult for the operator to read and manually input the data to the MICNS panel.

E. Safety/Health Hazard

1. The ambient noise level around the launcher just prior to launch is high enough to interfere with crewmen communications using the field ground landline. The high noise levels also interfere with verbal communications among the crewmen.

2. During OT II a launch was aborted because the GCS operator interpreted the launch operator to say "no beacon" when the launch operator said "good beacon."

3. Personnel can accidentally activate launcher vehicle systems while crewmen and maintainers are performing PMCS or maintenance activities on vehicles. For example, two crewmen have been injured while testing the shuttle lock microswitch. The launcher hydraulic system was activated, the crewmen checked the microswitch by pushing it and were struck in the hand by the microswitch armature plunger.

4.10 15_CTA0037 Perform handoff.

4.10.1 Procedural reference:

a. DEP 55-1550-200-CL-2 pages N-2 through N-3
b. TM 55-1550-200

4.10.2 The timed measure began when the AV reached the handoff. The timed measure stopped when control of the AV was transferred to the receiving GCS, or handoff was terminated.

4.10.3 Table 4.10.3 lists the descriptive statistics for 15_CTA0037 Perform handoff. The median time to perform a handoff was low (Median = 1.85 minutes). There were 121 successful handoffs (Mean = 1.9 minutes) and 6 unsuccessful handoffs (Mean = 4.5 minutes).

4.10.4 Table 4.10.4 lists the mean times to perform handoffs. The means are consistent and range from 5.6 to 1.6 minutes.

4.10.5 Figure 4.10.5 shows the trials for successful (Y) and unsuccessful (N) handoffs. Trials for successful handoffs were consistent with slight variability. GCS crewmen can communicate the required data within the short timeframe indicated in the figure.

Table 4.10.3. Overall Descriptive Statistics for Performing Handoff Operations

15_CTA0037 FROM 87018 TO 87087
PERFORM HANDOFF OPERATIONS

TOT_MIN SCORES > 7 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	127	SUM WGTS	127
MEAN	2.0542	SUM	260.883
STD DEV	0.947367	VARIANCE	0.897504
SKEWNESS	2.23701	KURTOSIS	6.48544
USS	648.992	CSS	113.086
CV	46.1186	STD MEAN	0.0840652
T:MEAN=0	24.4358	PROB>|T|	0.0001
SGN RANK	4064	PROB>|S|	0.0001
NUM ¬= 0	127		
D:NORMAL	0.151754	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	6.1	99%	6.03466
75% Q3	2.35	95%	3.93333
50% MED	1.85	90%	2.90667
25% Q1	1.48333	10%	1.21
0% MIN	0.633333	5%	1.09333
		1%	0.661333
RANGE	5.46667		
Q3-Q1	0.866667		
MODE	1.15		

EXTREMES

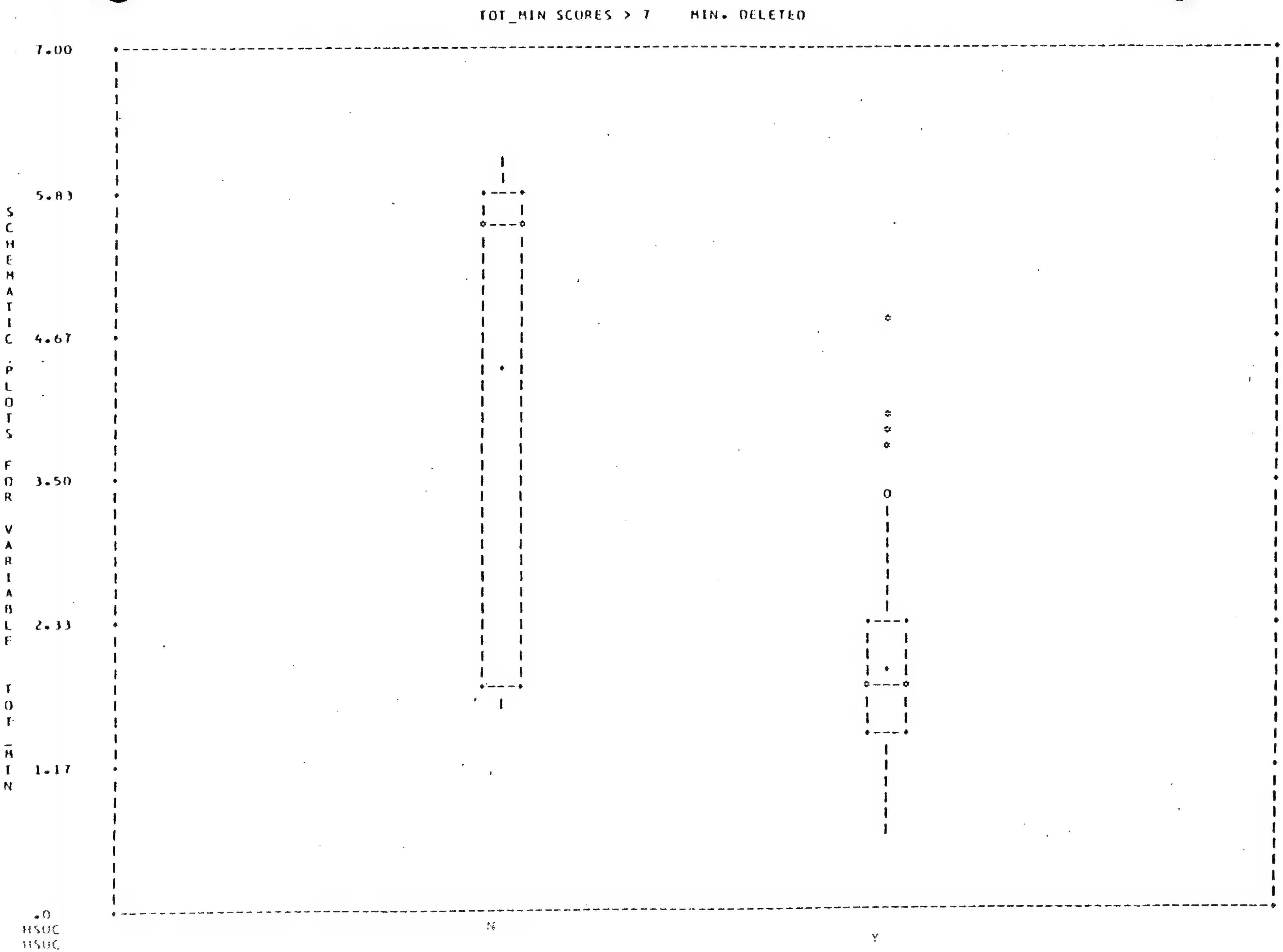
LOWEST	HIGHEST
0.633333	4.75
0.733333	5.61667
0.833333	5.65
0.966667	5.86667
1.03333	6.1

Table 4.10.4. Mean Times to Perform Handoff Operations by Week of the Test

15_CTA0037 FROM 87018 TO 87087
PERFORM HANDOFF OPERATIONS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=1									
TOT_MIN	23	2.132	1.163	0.633	5.650	0.242	49.033	1.352	54.534
WEEK=2									
TOT_MIN	24	1.934	0.469	1.217	3.050	0.096	46.417	0.220	24.251
WEEK=3									
TOT_MIN	7	5.655	5.809	1.033	13.967	2.196	39.583	33.749	102.735
WEEK=4									
TOT_MIN	10	1.977	0.555	1.283	3.067	0.176	19.767	0.308	28.084
WEEK=5									
TOT_MIN	3	2.789	1.104	1.633	3.833	0.638	8.367	1.219	39.593
WEEK=6									
TOT_MIN	2	1.683	0.259	1.500	1.867	0.183	3.367	0.067	15.402
WEEK=7									
TOT_MIN	33	2.053	0.918	0.833	5.867	0.160	67.750	0.842	44.692
WEEK=8									
TOT_MIN	17	2.224	1.246	1.283	6.100	0.302	37.800	1.552	56.032
WEEK=9									
TOT_MIN	10	1.652	0.488	1.067	2.633	0.154	16.517	0.238	29.529

Figure 4.10.5. Trials for successful (Y) and unsuccessful (N) handoffs.



4.10.6 Factors affecting 15_CTA0037 Perform handoff:

A. Procedural Considerations

A great deal of radio and voice communications occurs during handoff procedures. Only the necessary messages should be communicated.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Turning transmitter off too soon;

2. Improper PN codes (Long/Short code);

3. Not coordinating handoff waypoint;

4. Not in proper antijam mode when launching;

5. Not having the site setup at the GCSs (CLRS/FCS) which maximizes FM communications reception/transmission during handoff; and

6. Not verifying or crosschecking site setup data.

C. Training Implications

1. Communications discipline during handoff should be defined and stressed, especially the effects of excessive communications on mission performance.

2. An emphasis should be placed on the rationale, theory and concept of the use of the PN codes. The operators should clearly understand which one causes video link and which one causes no links.

3. The operators should be given a complete understanding of how meteorological information is to be obtained and how it will affect each mission. The need for constantly updating during the mission should be stressed.

4. Methods to achieve fuel economy while the AV is in flight should be included in training.

5. The implications of not calibrating the Navigation Display Unit (NDU) should be stressed.

D. Human Engineering Considerations

1. The low fuel warning signal which appears on the monitor does not attract the operator's attention during high concentration tasks such as recovery. No audio signal accompanies the flashing signal.

2. The noise level in the GCS makes communications difficult.

3. Receiving or sending simultaneous transmissions into the GCS radios scramble all of the transmissions.

4. A reevaluation of the controls and input information needs to be made with the objective of reducing the number of buttons, codes, and modes that the operator must concern himself with during handoff.

E. Maintenance

The generator is not adjusted to accept an instantaneous full load power requirement (auto transfer from primary generator to backup generator). If not adjusted correctly the backup generator will bog down at critical moments.

4.11 16_CTA0055 Position AV on gun target line.

4.11.1 During testing, it was determined that the AV could be positioned within 800 mils (400 mils left or right) of the gun target line for a Copperhead mission. Thus, the task was not difficult to perform and no data was processed for this task.

4.12 17_CTA0054 Operate mission payload system in track mode for Copperhead.

4.12.1 There were 19 Copperhead firings during testing. Six Copperhead firings failed to hit the target. Three of the misses were FCS sorties, while three were CLRS sorties. A human factors analysis was conducted of each Copperhead mission and laser break occurrences

4.12.2 Procedural reference:

a. FC-6-RPV
b. DEP 55-1550-200
c. TM 55-155-200

4.12.3 The timed measure for the laser activation began when the feature control button was pressed while the target was in the field of view (FOV). The timed measure stopped when the Copperhead round impacted or the MC commanded to cease lasing. The timed measure for laser break began when laser lock on was lost. The timed measure ended when the AVO reacquired laser lock on target.

4.12.4 Table 4.12.4 shows the times spent lasing the target prior to laser break and the times spent recovering the target after laser break. Four occurrences were recorded during testing. The times to recover the target ranged from 3 minutes to 19 minutes. Two major factors may have contributed to laser break and reacquiring the target: (a) the terrain the target was in occluded the target, and (b) the location of payload joystick and laser lock on control button.

4.12.5 Table 4.12.5 presents the results of a separate analysis of the live Copperhead engagements. The investigation represents an attempt to determine the extent to which crewmen experience might have contributed to their failures or to their successes. Selected factors beyond the control of the crewmen, but expected to affect performance, were examined as potential control measures. The small number of engagements precludes statistical treatment of the data. Nevertheless, three of the variables in the table appear to have a positive relationship to performance. These are sequence number, target motion, and range to target. All three of these have implications for training.

4.12.5.1 Sequence number. All of the failures but one occurred during the first half of the record firings, and the failure of the 19th round (sortie C046) has been attributed to a bad round. This suggests that experience may have played a role in the later successes. Some possible indications of what may have been learned will be described in the next section on target motion.

4.12.5.2 Target motion. Three of the six engagements of moving targets ended in failure, whereas only three of 13 engagements of stationary targets ended in failure. The small number of moving targets does not permit statistical treatment of these data. However, analysis of some of the individual sorties suggests that motion did play a role and what may have been learned by experience from early

engagements. However, care must be taken in attempting to draw inferences from these data as it can be seen that target motion is partially confounded with sequence number. Descriptions of the sorties are as follows:

a. Sortie F023. The target was lased and the coordinates given to the artillery battery at approximately 08:38:51. Based on shadows, it was possible to determine that the target was traveling in a northerly direction at that time and continued to do so until approximately 08:40:45. At that time, the target changed to an easterly direction and continued easterly until approximately 08:45:40, after which it turned northeasterly and continued in that direction until after the expected time of round impact at 08:47:16. Originally, the target was in an open area, but soon passed through a wooded area and into some deep shadows and behind vegetation. The vegetation blocked the laser making it impossible to maintain laser lock on the target. Laser lock was reestablished at approximately 08:46:57, some 19 seconds before impact. However, since the target had been moving for nearly eight minutes before the round was fired, the target may have been outside of the footprint. Also, at 15 seconds prior to impact, the range to the target was approxi-mately 2885, well beyond the desirable range based on the original coordinates. Upon observing that the target was approaching a wooded area, the mission commander (MC) could have called for a cease fire, waited until the target was in the open, established a new loiter pattern nearer the expected engagement area, and provided new coordinates to the artillery battery when the engagement could be commenced. The implication for training is that engagement procedures under adverse conditions or unusual circumstances need to be developed. Also, MCs must be trained to take target motion into account.

b. Sortie F034. This sortie was similar in some respects to sortie F023, except that the target did not become obscured by vegetation. The target was traveling in a generally consistent southeasterly direction throughout the engagement. It was possible to estimate the target's average speed as 3.3 M/second as coordinates were given at four different times over a period of approximately 3 minutes and 27 seconds. The final coordinates were provided at approximately 14:39:25 and impact was at approximately 14:41:58. During the period of approximately 2 minutes and 33 seconds between these events, the target traversed an estimated distance of 500 meters. This would have placed the target at the approximate edge of the footprint. The round missed the target, but was well within the field of view (FOV) of the payload. It is apparent that the MC attempted to take target motion into account by providing updated coordinates, although the probable impact point was not anticipated to ensure that the target would be well within the footprint. Again, there is an implication that techniques for engaging moving targets need to be emphasized in training. The timeline data from both this

sortie and sortie F023 further suggest that training to coordinate with the firing battery might lessen the overall engagement time and increase the likelihood of success.

c. Sortie C049. The last live Copperhead firing occurred during this sortie. A direct hit on the target was achieved. It is mentioned only because it suggests that previous experience of the battery affected the techniques employed. The MC anticipated the target path and gave coordinates in the direction of target travel, but well ahead of the actual target location at the time. This apparently ensured that the target would move into or remain in the footprint. It should be noted that this technique was not an invention of the MC. It is described in Field Circular FC-6-RPV, and its employment should have been attempted the previous moving target engagements. The failure of the crews to use this technique in sorties F023 and F034 suggests the need to refine training in this area. Even if this technique is employed, moving targets are still likely to be difficult to engage. The MC is basically required to predict the target's motion in both speed and direction, and targets on the battlefield may not always move as predicted and will likely attempt to use any available concealment and cover.

4.12.5.3 Range to target. Crewmen are told that it should be possible to successfully engage targets at AV-to-target ranges up to 2500 meters. They are also told that the optimum ranges are between 1500 and 2000 meters. The ranges of the successful engagements in OT II were typically less than the ranges of the failures. The median range of the successful engagements was 1614 meters, compared to 2200 meters for the failures. Also, 8 of the 13 successful engagements were conducted with AV-to-target ranges within the 1500-2000 meter band, while only one of the six failures was within the smaller range. Furthermore, that one engagement resulted in a very small miss distance. The data suggested that range to target affected the outcome and the range was affected to some degree by target movement.

4.12.5.4 Other factors. No discernible trends in the relationships between successful outcome and any of the other variables could be detected. Timeline data for this task were obtained for laser breaks. These data showed that breaks occurred during only four sorties. In only one of these, sortie F023, did the break occur at a time when it could have a conceivable impact on the outcome. These data indicate that laser breaks are not a significant problem when targets are in open territory. Therefore, the need for additional MPO training on any other factors cannot be determined from the data.

Table 4.12.4. Times Spent Lasing the Target and Times to Recover Target

17_CTA0054 FROM 87018 TO 87087
OPERATE THE MISSION PAYLOAD SYSTEM:
TIME TO RECOVER AFTER LASER BREAK

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE
WEEK=WK2: 25-31 JAN									
BEFORE	TIME*BEFORE*BREAK	1	40.00	.	40.00	40.00	.	40.00	.
RECOVER	TIME TO*RECOVER*TARGET	1	19.00	.	19.00	19.00	.	19.00	.
WEEK=WK7: 1-7 MAR									
BEFORE	TIME*BEFORE*BREAK	1	3.00	.	3.00	3.00	.	3.00	.
RECOVER	TIME TO*RECOVER*TARGET	1	6.00	.	6.00	6.00	.	6.00	.
WEEK=WK8: 8-14 MAR									
BEFORE	TIME*BEFORE*BREAK	1	5.00	.	5.00	5.00	.	5.00	.
RECOVER	TIME TO*RECOVER*TARGET	1	3.00	.	3.00	3.00	.	3.00	.
WEEK=WK9: 15-21 MAR									
BEFORE	TIME*BEFORE*BREAK	1	16.00	.	16.00	16.00	.	16.00	.
RECOVER	TIME TO*RECOVER*TARGET	1	3.00	.	3.00	3.00	.	3.00	.

Table 4.12.5. Human Factors Analysis of Copperhead Engagements

Sortie number	Outcome	Sequence numbers	Target motion	Degree of obscuration	Image quality	Laser break	Level of potential distractions	Range to target	MPO handedness	Crew size	Comments
F023	F	2	M	4	2	1	3	2885	R	4	
F032	F	4	S	1	2	0	1	1760	R	5	Very close miss.
F034	F	5	M	1	1	0	4	2145	R	4	Round impact was well within FOV of payload.
C025	F	7	S	1	1	0	2	2175	R	4	
C026	F	8	S	1	3	0	3	2254	R	4	Scored as possible bad round.
C046	F	19	M	1	3	0	2	2225	L	4	Scored as possible bad round.
F027	S	3	M	1	2	0	2	1680	R	4	
F039	S	6	S	1	3	0	3	2310	R	3	
C031	S	9	S	1	2	0	2	1854	L	4	
F049	S	10	S	1	2	0	3	1515	R	3	
C033	S	11	S	1	1	0	1	1625	R	4	
F053	S	12	S	1	3	0	2	1133	R	4	
C034	S	13	S	1	1	0	2	1923	R	4	
F055	S	14	S	1	1	0	2	1434	R	3	
F055	S	15	S	1	1	0	2	1373	R	3	
C036	S	16	S	1	2	0	3	1323	L	4	
C036	S	17	M	1	1	0	3	1823	L		
F068	S	18	M	1	1	0	3	1614	R	4	
C049	S	19	M	1	2	0	2	1514	R	4	

Table 4.12.5. Human Factors Analysis of Copperhead Engagements (Cont'd.)

Description
<u>of Variables</u>

Sortie:	Sortie numbers were assigned to missions flown in sequence. For example, F023 was the 23rd sortie flown by the FCS and C025 was the 25th sortie flown by the CLRS, including those before the record trials. The numbers shown are those sorties during which live Copperhead rounds were fired.
Outcome:	F denotes failure of the engagement and S denotes success.
Sequence number:	The sequence in which the rounds were fired. For example, sequence number 4 indicates that it was the 4th round fired without regard for whether the engagement was conducted by the FCS or the CLRS. The first round fired is not shown as the engagement was conducted by the CLRS before the record trials began.
Target motion:	M denotes a moving target and S denotes a stationary target.
Image quality:	A subjective rating of the overall quality of the imagery viewed on the operator consoles. 1 denotes very poor imagery and 5 denotes very good imagery.
Degree of obscuration:	A subjective rating of environmental/geographical conditions that would cause the system to lose lock resulting in laser break. 1 denotes no or very minimal such conditions and 5 denotes near complete obscuration. As can be seen, only one sortie, F023, is rated above 1. This was due to the target passing through deep shadows and behind vegetation several times during the intended engagement sequence. This did not happen during any of the other engagements.
Laser break:	A score of 0 indicates that there were no laser breaks during the 15-second period prior to impact. A score of 1 indicates a laser break or breaks during the 15 seconds prior to impact.
Level of potential distractions:	A subjective rating of potentially distracting activities, especially communications, occurring during the engagement. A score of 1 indicates a low level of potential distractions, a score of 5 indicates a high level.
Range to target:	The range of the AV to the target 15 seconds prior to impact.
MPO handedness:	The preferred hand of the MPO. L indicates that the MPO was lefthanded and R that the MPO was righthanded.
Crew size:	The number of crewmen in the control station during the engagement. The number does not include data collectors or Battery personnel.

4.12.6 Factors affecting 17_CTA 0054 Operate mission payload system in track mode for Copperhead:

A. Procedural Considerations

Most missions were conducted with four- rather than three-man crews. A third operator sat at the MC console while the MC moved about within the shelter, gave instructions, observed the NDU, and handled some of the communications.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Lasing the wrong area on the target (e.g., selecting the treads on a tank rather than the area between the hull and the turret);

2. Not noticing a laser break;

3. Not arming the laser or placing it in the "eye hazard" mode;

4. Choosing loiter area too far from projected impact point;

5. Entering incorrect codes;

6. Selecting incorrect pulse rate; and

7. Selecting incorrect footprint.

C. Training Implications

Note: The training implications for crewmen conducting Copperhead engagements are discussed in the previous section providing human factors analysis of the OT II engagements.

D. Manpower Implications

Although the GCS is designed to function with a three-man crew, a four-man crew was typically employed during OT II. The MCs felt they needed to be free to oversee the mission and supervise their personnel. The effect this may have had on mission accomplishment cannot be determined. However, as will be described later in the human factors analysis of the Copperhead engagements, the MC must exercise considerable judgment and ensure that the target will remain within the footprint during the engagement sequence. This, added to his normal workload, may exceed the MC's capacity, justifying the need for a fourth operator, at least for Copperhead missions.

E. Human Engineering Considerations

1. Console display monitor resolution may be degraded by routing the video signal through the MICNS device. The degraded video signal may not be sufficient for the task of target detection or identification. Measurement of resolution or the crew's ability is outside the scope of the current human factors assessment. Further investigation by USAOTEA is required if this is the case.

2. The roll inhibit function should be transparent or automatic for the operator. Roll inhibit could be controlled based upon AV speed, down look angle, and radii of turn selected.

3. Use of the headphone push-to-talk switches would be facilitated by the use of footswitches.

4. The mission commander's console is not being used as designed or planned. Rather than using the console, the MC is often planning, observing other operators, or communicating over the radios. The MC console might be redesigned.

5. The main power cable for the communications rack is located about one inch off the floor directly behind the MC's chair. It is unprotected and protrudes into the open space, making it susceptible to being stepped on and broken. In such a case all communications with the GCS would be lost.

6. The operator headset mike jack is in a location on the console where it hangs in front of the operator and interferes with his operation of the console.

7. The XY plotter arms on the NDU are too large and occlude critical map information at points of interest.

8. The laser fire button is inappropriately located for use by a right-handed operator. Firing requires a cross-handed movement.

9. The joystick was judged by operators to be too stiff for accurate tracking.

10. There are more buttons/controls on the MPO console than are necessary. The following should be evaluated for change:

   (a) The three FOV buttons could be replaced with a single step switch button, but the concept would have to be evaluated in use to ensure the MPO recognizes the FOV.

   (b) The rate step switch should be replaced with a toggle switch which increases rate in one direction and decreases it in the other.

   (c) The "autosearch faster" and "autosearch slower" buttons should be replaced with a toggle switch which increases rate in one direction (up) and decreases it in the other (down).

11. The console operators may require a greater degree of control over the adjustment of monitor contrast, brightness, and focus than is provided.

12. The blower vent at the front of the operator console emits air into the operator's face. This air flow interferes with the operator's ability to view the screens and also dries out the eye fluids, leading to operator eye fatigue and discomfort.

13. Data for artillery adjust should be transmitted directly to the DMD to save time and reduce potential input errors.

F. Potential Solutions

1. Two solutions to the laser firing problem for right-handed operators were suggested:

(a) Add a second laser fire button to the left of the joystick.
(b) Place the laser fire button on tip of the joystick with a safety cover, and require a conscious effort by the operator to fire the laser.

2. Three changes to improve tracking performance were suggested:

(a) Make the joystick larger and provide fingergrips.
(b) Allow the joystick to move and correlate speed of payload movement with extent of joystick movement.
(c) Replace the joystick with a track ball.

3. Design the single 20 degree switch button so that it can toggle between 20, 7.2 and 2.7 in that order.

4. Remove and replace the current 30-minute video recorder with a VHS recorder to allow for longer recording times.

5. Replace the current DMD with a device that would automatically receive target data (HE, Copperhead, and targets of opportunity). Data should also be transmitted electronically to the proper agency with just a simple button push.

4.13 18_CTA0051 Perform artillery adjust mission.

4.13.1 Procedural reference:

a. DEP 55-1550-200-CL-2 page N-11
b. TM 55-1550-200

4.13.2 The timed measure began when the first round impacted into the field of view near the target. The timed measure ended when end of mission message was sent.

4.13.3 Table 4.13.3 lists the overall descriptive statistics for 18_CTA0051 Perform artillery adjust-conventional munitions. The time to perform the task was low (Median = 1.5 minutes).

4.13.4 Table 4.13.4 lists the mean times to perform the artillery adjust mission by week of the test. Few artillery adjust trials were conducted during the early weeks of the test. The majority of the artillery adjust trials were conducted in the last three weeks of the test. Mean times to perform the adjustment ranged from 1.6 to 2.1 minutes. Other data indicated that the FCS mission commanders required slightly more time to communicate the adjustment than did CLRS mission commanders (Mean, FCS = 2.0 minutes, N=57; Mean, CLRS = 1.5 minutes, N=58).

4.13.5 Figure 4.13.5 shows box and whisker plots of trials to perform artillery adjustment. The boxes for weeks 7, 8, and 9 indicate that artillery adjustment was performed consistently by crewmen. The elongated box for week 4 resulted from one extreme value (Maximum value = 5.57 minutes) and a small sample size (N=3).

Table 4.13.3. Overall Descriptive Statistics for Perform Artillery Adjust Mission

18_CTA0051 FROM 87018 TO 87087
PERFORM ARTILLERY ADJUST MISSION
BY MISSION COMMANDER FOR CONVENTIONAL
MUNITIONS

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	113	SUM WGTS	113
MEAN	1.79041	SUM	202.317
STD DEV	1.10711	VARIANCE	1.2257
SKEWNESS	1.66888	KURTOSIS	2.85784
USS	499.509	CSS	137.279
CV	61.8357	STD MEAN	0.104149
T:MEAN=0	17.1909	PROB>|T|	0.0001
SGN RANK	3220.5	PROB>|S|	0.0001
NUM ¬= 0	113		
D:NORMAL	0.168369	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	5.6	99%	5.59533
75% Q3	2.04167	95%	4.33333
50% MED	1.53333	90%	3.48333
25% Q1	1.00833	10%	0.83
0% MIN	0.333333	5%	0.656667
		1%	0.333333
RANGE	5.26667		
Q3-Q1	1.03333		
MODE	0.95		

EXTREMES

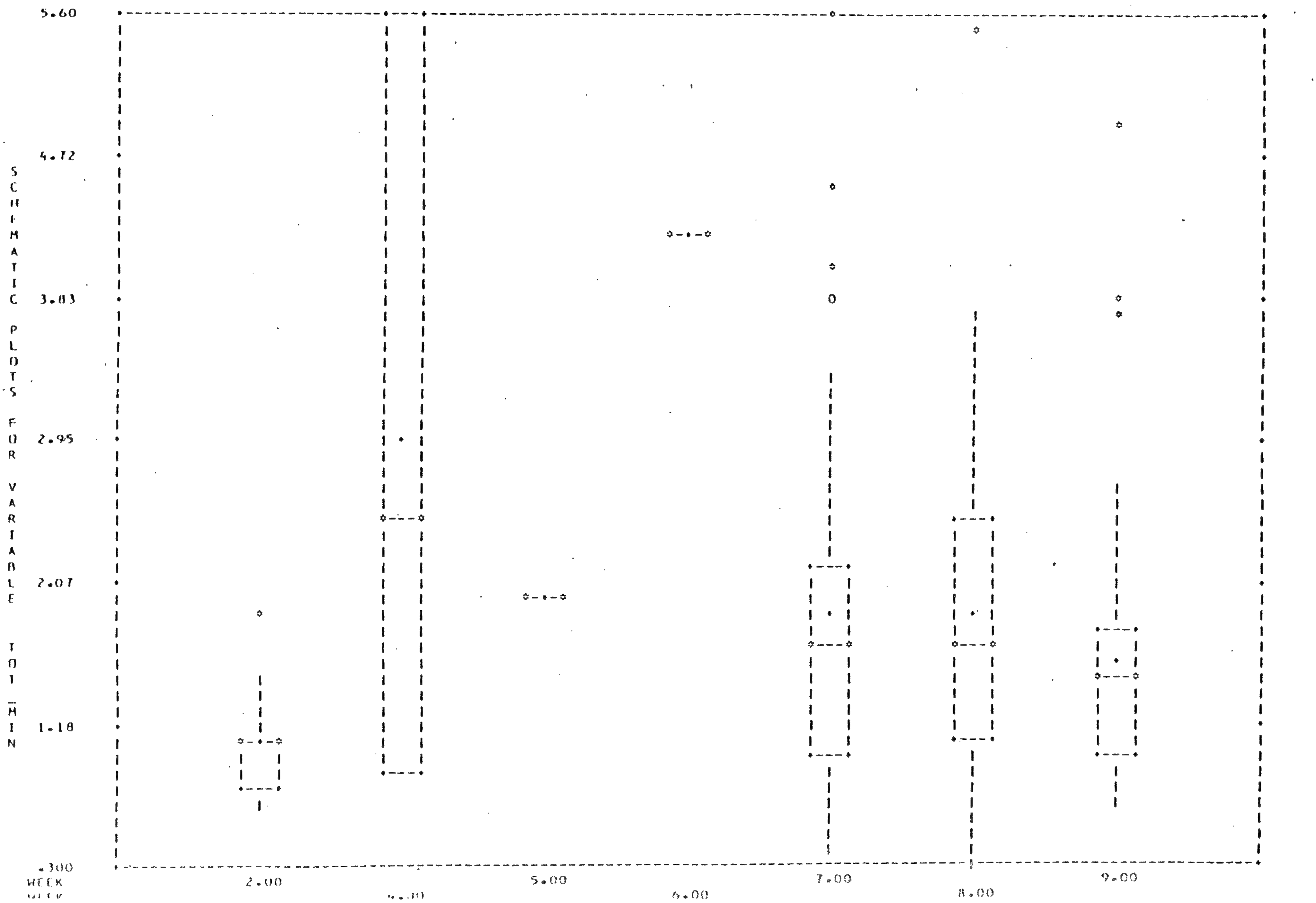
LOWEST	HIGHEST
0.333333	4.56667
0.333333	4.95
0.366667	5.55
0.5	5.56667
0.633333	5.6

Table 4.13.4. Mean Times to Perform Artillery Adjust Mission by Week of the Test

18_CTA0051 FROM 87018 TO 87087
PERFORM ARTILLERY ADJUST MISSION
BY MISSION COMMANDER FOR CONVENTIONAL
MUNITIONS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK2: 25-31 JAN									
TOT_MIN	5	1.10	0.46	0.67	1.83	0.20	5.48	0.21	41.74
WEEK=WK4: 8-14 FEB									
TOT_MIN	3	2.99	2.37	0.90	5.57	1.37	8.97	5.62	79.34
WEEK=WK5: 15-21 FEB									
TOT_MIN	1	1.98	.	1.98	1.98	.	1.98	.	.
WEEK=WK6: 22-28 FEB									
TOT_MIN	1	4.23	.	4.23	4.23	.	4.23	.	.
WEEK=WK7: 1-7 MAR									
TOT_MIN	31	2.12	1.73	0.37	8.63	0.31	65.57	3.00	81.89
WEEK=WK8: 8-14 MAR									
TOT_MIN	30	1.89	1.08	0.33	5.55	0.20	56.78	1.16	56.97
WEEK=WK9: 15-21 MAR									
TOT_MIN	43	1.58	0.85	0.72	4.95	0.13	67.93	0.72	53.57

Figure 4.1[illegible]5. Box and whisker plots of trials for perform artillery adjust mission by mission commander for conventional munitions.



4.13.6 Factors affecting 18_CTA0051 Perform artillery adjust-conventional munitions:

A. Human Engineering Considerations

1. Console display monitor resolution or routing the signal through the MICNS device may not be sufficient for the task of target detection or identification. Measurement of resolution or the crew's ability is outside the scope of the current human factors assessment. Further investigation by USAOTEA is required if this is the case.

2. The roll inhibit button and function should be considered for elimination and replacement by software that would be activated any time a planned or immediate maneuver was executed.

3. Use of headphone push-to-talk switches would be facilitated by the use of footswitches.

4. The mission commander's console is not being used as designed or planned. Rather than using the console, the MC is often planning, observing other operators, or communicating over the radios. The MC console might be redesigned.

5. The operator headset mike jack is in a location on the console where it hangs in front of the operator and interferes with his operation of the console.

6. There are more controls on the MPO console than are necessary. The following should be evaluated for change:

(a) The three FOV buttons could be replaced with a single step switch button, but the concept would have to be evaluated in use to ensure the MPO recognizes the FOV.

(b) The rate step switch should be replaced with a toggle switch which increases rate in one direction and decreases it in the other.

(c) The "autosearch faster" and "autosearch slower" buttons should be replaced with a toggle switch which increases rate in one direction and decreases it in the other.

7. The console operators may require a greater degree of control over the adjustment of monitor contrast, brightness and focus than is provided.

8. The blower vent at the front of the operator console emits air into the operator's face. This air flow interferes with the operator's ability to view the screens and also dries out the eye fluids, leading to operator eye fatigue and discomfort.

B. Potential Solutions

1. Remove and replace the current 30-minute video recorder with a VHS recorder to allow for longer recording times.

2. Replace the current DMD with a device that would automatically receive target data (HE, Copperhead, and targets of opportunity). Data should also be transmitted electronically to the proper agency with just a simple button push.

4.14 19_CTA0052 Perform damage assessment.

4.14.1 Procedural reference:

a. DEP 55-1550-200-CL-2 page N-11
b. TM 55-1550-200

4.14.2 Timed measure began when a decision was made that the target area was identified and verbally announced. The timed measure ended when the SALUTE report was transmitted as directed in the mission order.

4.14.3 Table 4.14.3 lists the overall descriptive statistics for 19_CTA0052 Perform damage assessment. The median time to perform the task (Median = 0.33 seconds) and the sample size of trials (N=24) were low.

4.14.4 Table 4.14.4 lists the mean times to perform damage assessment by week of the test. The means are consistent for all weeks except for week 2 which included an extreme value (Maximum value = 8.92 minutes). Mission commanders perform the task without difficulties.

Table 4.14.3. Overall Descriptive Statistics for Perform Damage Assessment Operations

19_CTA0052 FROM 87018 TO 87087
PERFORM DAMAGE ASSESSMENT OPERATIONS

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	24	SUM WGTS	24
MEAN	1.04861	SUM	25.1667
STD DEV	1.93957	VARIANCE	3.76193
SKEWNESS	3.24546	KURTOSIS	12.1226
USS	112.914	CSS	86.5244
CV	184.966	STD MEAN	0.395913
T:MEAN=0	2.64859	PROB>|T|	0.0143535
SGN RANK	150	PROB>|S|	0.0001
NUM ^= 0	24		
W:NORMAL	0.577502	PROB<W	<0.01

QUANTILES(DEF=4)

100% MAX	8.91667	99%	8.91667
75% Q3	1.0625	95%	7.57075
50% MED	0.333333	90%	3.26666
25% Q1	0.0166667	10%	0.0166667
0% MIN	0.0166667	5%	0.0166667
		1%	0.0166667
RANGE	8.9		
Q3-Q1	1.04583		
MODE	0.0166667		

EXTREMES

LOWEST	HIGHEST
0.0166667	1.66667
0.0166667	2.21667
0.0166667	3
0.0166667	3.53333
0.0166667	8.91667

Table 4.14.4. Mean Times to Perform Damage Assessments by Week of the Test

19_CTA0052 FROM 87018 TO 87087
PERFORM DAMAGE ASSESSMENT OPERATIONS

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK2: 25-31 JAN									
TOT_MIN	6	3.21	3.01	0.62	8.92	1.23	19.28	9.06	93.67
WEEK=WK3: 1-7 FEB									
TOT_MIN	1	0.67	.	0.67	0.67	.	0.67	.	.
WEEK=WK4: 8-14 FEB									
TOT_MIN	1	0.17	.	0.17	0.17	.	0.17	.	.
WEEK=WK7: 1-7 MAR									
TOT_MIN	7	0.17	0.26	0.02	0.58	0.10	1.17	0.07	154.38
WEEK=WK8: 8-14 MAR									
TOT_MIN	6	0.64	0.65	0.02	1.67	0.27	3.83	0.42	101.81
WEEK=WK9: 15-21 MAR									
TOT_MIN	3	0.02	0	0.02	0.02	0	0.05	0	0.00

4.14.5 Factors affecting 19_CTA0052 Perform damage assessment:

A. Potential Errors

Failure to use the Salute format in reporting damage.

B. Human Engineering Considerations

1. The main power cable for the communications rack is located about one inch off the floor directly behind the MC's chair. It is unprotected and protrudes into the open space, making it susceptible to being stepped on and broken. In such a case all communications with the GCS would be lost.

2. The mission commander's console is not being used as designed or planned. Rather than using the console, the MC is often planning, observing other operators, or communicating over the radios. The MC console might be redesigned.

4.15 20_CTA0039 Lost link reacquisition.

4.15.1 Procedural reference:

a. DEP 55-1550-200-CL-2 pages E-6 through E-11
b. TM 55-1550-200

4.15.2 The timed measure started when the lost link timer was started and the video image was on hold. The timed measure ended when control of the AV was regained or the relink attempt was aborted.

4.15.3 Table 4.15.3 lists the overall descriptive statistics for 20_CTA0039 Lost link reacquisition. The median time to reestablish link with the AV was 5.5. minutes.

4.15.4 Table 4.15.4 lists the mean times to reestablish link by week of the test. Weeks 1, 3, and 8 list the highest means (Mean, week 1 = 8.02 minutes; week 3 = 7.79 minutes; week 8 = 6.32 minutes). However, the total number of trials examined was low (N=24).

4.15.5 Figure 4.15.5 shows the box and whisker plots for reestablishing link with the AV. There appeared to be a great deal of variability in the times to reestablish link. This was due to the large number of procedural checks and rechecks that must be made by the AVO and MC. The procedures were often conducted by the entire GCS crew as a result of the number of indicators that must be monitored and the number of steps that must be conducted. Other data indicated that there was no practical difference in the times for the CLRS GCS (mean = 5.6 minutes, N=11) and FCS GCS (Mean = 5.4 minutes, N=10).

Table 4.15.3. Overall Descriptive Statistics for Perform Emergency In-Flight Lost Link Operations

20_CTA0039 FROM 87018 TO 87087
PERFORM EMERGENCY IN-FLIGHT LOST LINK
OPERATIONS BY THE AIR VEHICLE OPERATOR
TOT_MIN SCORES = 0 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	21	SUM WGTS	21
MEAN	5.48333	SUM	115.15
STD DEV	4.76683	VARIANCE	22.7227
SKEWNESS	0.566651	KURTOSIS	-0.604075
USS	1085.86	CSS	454.453
CV	86.9331	STD MEAN	1.04021
T:MEAN=0	5.27138	PROB>|T|	0.0001
SGN RANK	115.5	PROB>|S|	0.0001
NUM ^= 0	21		
W:NORMAL	0.90958	PROB<W	0.055

QUANTILES(DEF=4)

100% MAX	15.25	99%	15.25
75% Q3	7.975	95%	15.1
50% MED	5.55	90%	13.6
25% Q1	0.583333	10%	0.17
0% MIN	0.0833333	5%	0.0916666
		1%	0.0833333
RANGE	15.1667		
Q3-Q1	7.39167		
MODE	0.0833333		

EXTREMES

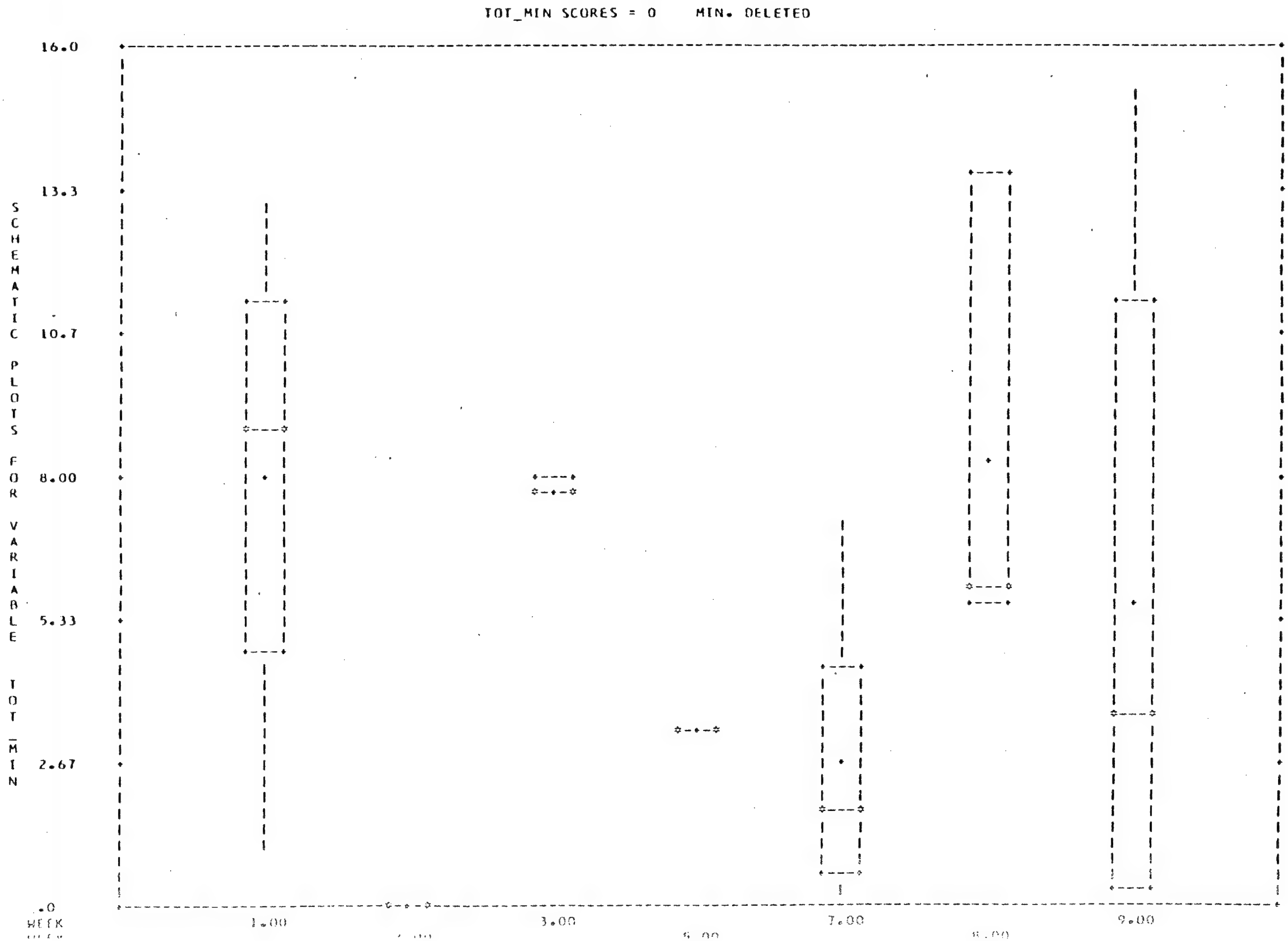
LOWEST	HIGHEST
0.0833333	8.08333
0.166667	9.81667
0.183333	13
0.2	13.75
0.533333	15.25

Table 4.15.4. Mean Times to Reestablish Link by Week of the Test

20_CTA0039 FROM 87018 TO 87087
PERFORM EMERGENCY IN-FLIGHT LOST LINK
OPERATIONS BY THE AIR VEHICLE OPERATOR

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	4	8.02	4.98	1.20	13.00	2.49	32.10	24.85	62.12
WEEK=WK2: 25-31 JAN									
TOT_MIN	2	0.04	0.06	0	0.08	0.04	0.08	0.00	141.42
WEEK=WK3: 1-7 FEB									
TOT_MIN	2	7.79	0.11	7.72	7.87	0.08	15.58	0.01	1.36
WEEK=WK5: 15-21 FEB									
TOT_MIN	1	3.37	.	3.37	3.37	.	3.37	.	.
WEEK=WK7: 1-7 MAR									
TOT_MIN	7	2.28	2.73	0	7.23	1.03	15.95	7.48	120.00
WEEK=WK8: 8-14 MAR									
TOT_MIN	4	6.31	5.65	0	13.75	2.83	25.25	31.96	89.56
WEEK=WK9: 15-21 MAR									
TOT_MIN	4	5.70	7.17	0.17	15.25	3.59	22.82	51.44	125.74

Figure 4.15.5. Box and whisker plots for reestablishing link.



4.15.6 Factors affecting 20_CTA0039 Lost link reacquisition:

A. Human Engineering Considerations

1. The lost link lights are in a location at the console above the operator's monitor. The operators frequently were not aware that lost link had occurred because this position is not frequently monitored and no alerting device is employed, e.g., flashing light or warning buzzer. Typically, he may not know until he notices that he has a video freeze.

2. The upper control panels are higher than necessary and remove some information from the operator's normal scan area. Constantly scanning the upper panel causes undue fatigue. In MOPP gear the problem is compounded.

4.16 21_CTA0049 Perform AV recovery.

4.16.1 Procedural reference:

a. DEP 55-1550-200-CL-6 pages N-5 through N-6
b. TM 55-1550-200-10

4.16.2 The timed measure began when the recovery system activation checkout was initiated. The timed measure ended when the AV impacts the net.

4.16.3 Table 4.16.3 lists the overall descriptive statistics for 21_CTA0049 Perform AV recovery. The median time to recover an AV was 40.8 minutes.

4.16.4 Table 4.16.4 lists the mean time to perform air vehicle recovery by week of the test. The range of means was large (Mean, highest = 82.64 minutes; Mean, lowest = 16.83 minutes).

4.16.5 Figure 4.16.5 shows the box and whisker plots for recovery trials. Time used for recovery procedures was consistently long and increased in the last weeks of the test. Perhaps the distance the AV travels from a recovery vehicle should be minimized, allowing more flight time for reconnaissance. Other data indicated that the first recovery of the day (Mean = 65.4 minutes, N=34) required more time to recover the AV than did the middle (Mean = 45.8 minutes, N=28) or last (Mean = 37.3 minutes, N=19) trials of the day.

Table 4.16.3. Overall Descriptive Statistics for Perform Air Vehicle Recovery

21_CTA0049 FROM 87018 TO 87087
PERFORM AIR VEHICLE RECOVERY

TOT_MIN SCORES > 200 MIN. DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS

N	79	SUM WGTS	79
MEAN	52.235	SUM	4126.57
STD DEV	36.441	VARIANCE	1327.95
SKEWNESS	1.51999	KURTOSIS	1.83369
USS	319131	CSS	103580
CV	69.7635	STD MEAN	4.09993
T:MEAN=0	12.7405	PROB>|T|	0.0001
SGN RANK	1580	PROB>|S|	0.0001
NUM ~= 0	79		
D:NORMAL	0.177537	PROB>D	<0.01

QUANTILES(DEF=4)

100% MAX	170.65	99%	170.65
75% Q3	62.3333	95%	143.4
50% MED	40.7833	90%	110.083
25% Q1	28.0833	10%	18.75
0% MIN	7.95	5%	12.8
		1%	7.95
RANGE	162.7		
Q3-Q1	34.25		
MODE	7.95		

EXTREMES

LOWEST	HIGHEST
7.95	129.583
10.05	143.4
10.5833	144.633
12.8	157.867
14.5833	170.65

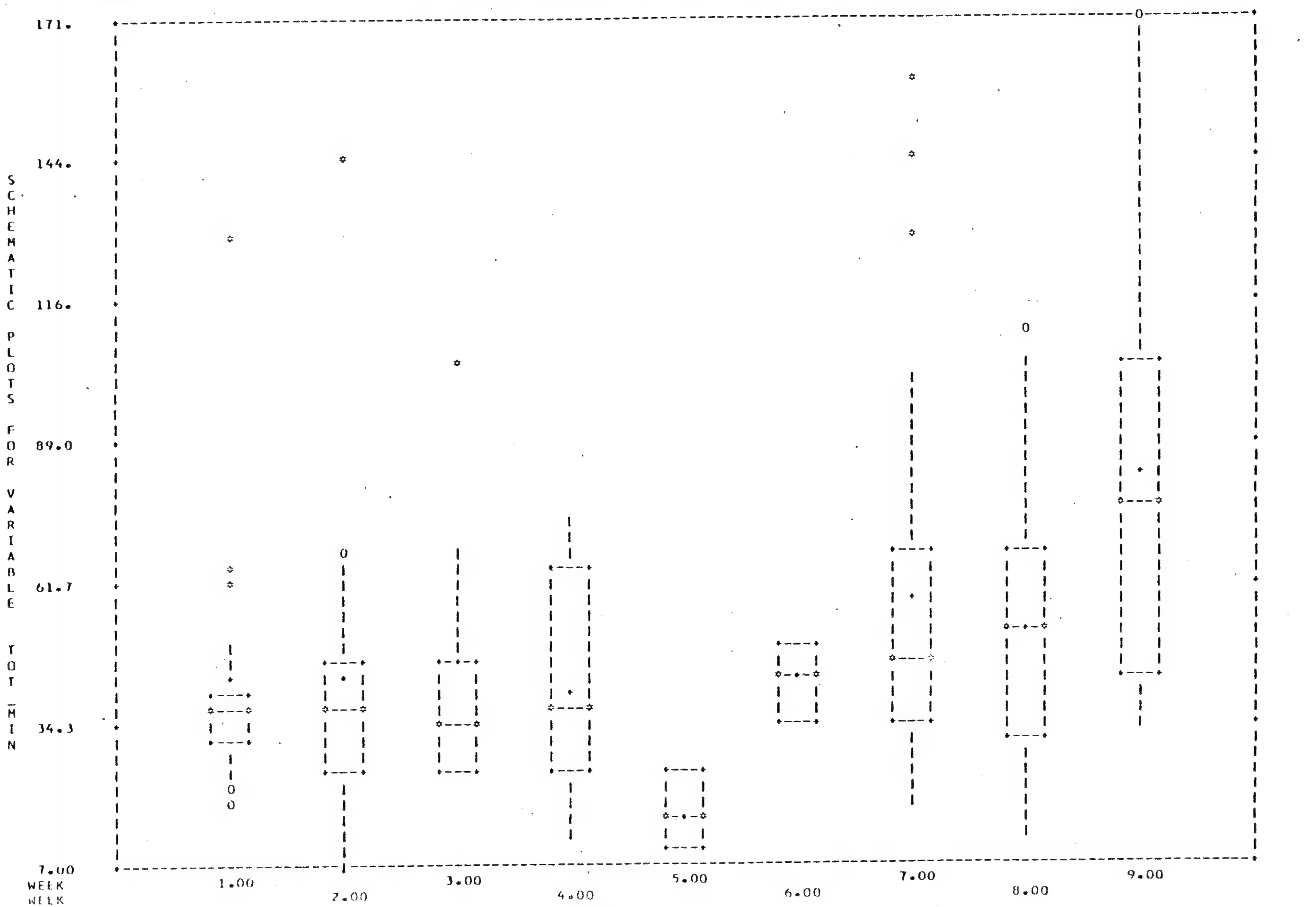
Table 4.16.4. Mean Times to Perform Air Vehicle Recovery by Week of the Test

21_CTA0049 FROM 87018 TO 87087
PERFORM AIR VEHICLE RECOVERY

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	14	56.84	52.54	20.05	211.75	14.04	795.70	2760.97	92.45
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	42.93	34.71	7.95	143.40	9.63	558.05	1204.75	80.86
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	45.70	29.97	25.20	104.33	12.23	274.22	897.90	65.56
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	41.85	23.22	12.80	72.98	9.48	251.12	539.34	55.49
WEEK=WK5: 15-21 FEB									
TOT_MIN	3	16.83	7.30	10.05	24.55	4.21	50.48	53.23	43.36
WEEK=WK6: 22-28 FEB									
TOT_MIN	2	42.86	10.15	35.68	50.03	7.18	85.72	102.96	23.68
WEEK=WK7: 1-7 MAR									
TOT_MIN	18	59.41	41.87	18.75	157.87	9.87	1069.35	1753.35	70.48
WEEK=WK8: 8-14 MAR									
TOT_MIN	9	77.52	77.80	14.58	270.42	25.93	697.72	6052.78	100.36
WEEK=WK9: 15-21 MAR									
TOT_MIN	10	82.64	45.30	34.03	170.65	14.32	826.38	2051.75	54.81

Figure 4.10.3. Box and whisker plots for recovery trials.

TOT_MIN SCORES > 200 MIN. DELETED



4.17 22_CTA0066 and 23_CTA0067 Remove recovery net and Shutdown recovery subsystem.

4.17.1 Procedural reference:

a. DEP 55-1550-200-CL-6 pages N-7 through N-8
b. TM 55-1550-200

4.17.2 The timed measure for shutdown of the recovery vehicle began when the order to shutdown was given. The timed measure ended when the recovery vehicle returned to hide position or was ready for march. The timed measure for removal and stowage of the recovery barrier began when the barrier structure was tilted downward. The timed measure ended when the recovery net was folded.

4.17.3 Table 4.17.3 lists the overall descriptive statistics for 22_CTA0066 Remove recovery net and 23_CTA0067 Shutdown recovery subsystem. The time required to remove and stow the recovery barrier (Median = 2.15 minutes) was less than the total time to shutdown the recovery vehicle (Median = 13.2 minutes). The difference between the two values (Median, difference = 11 minutes) is the time required to prepare the recovery vehicle for movement. Due to the prominent visual signature of the emplaced recovery vehicle, the length of time required to prepare the recovery vehicle for movement may have implications for the survivability of the system. The task 21_CTA0049 Perform AV recovery (Median = 40.8 minutes), the task of removing the AV from the recovery net (not a critical task), and shutdown of the air vehicle (Median = 13.2 minutes) implies that the recovery vehicle was emplaced and exposed for almost one hour.

4.17.4 Tables 4.17.4.1 and 4.17.4.2 list the mean times for removal of the recovery barrier and shutdown of the recovery vehicle. Table 4.17.4.1 indicates that crewmen required more time to remove the barrier in the first weeks of the test (Mean, week 1 = 10.21 minutes; week 2 = 10.09 minutes; week 3 = 10.67 minutes) than during the later weeks of the test. Table 4.17.4.2 indicates consistent means with the exception of week 7 (Mean = 292.9 minutes) in which a RAM incident resulted in unfinished shutdown procedures leading to an extreme value (Maximum value = 5001.7 minutes). The extreme value was not included in other analyses.

4.17.5 Figures 4.17.5.1 and 4.17.5.2 show the box and whisker plots for removal of the barrier and shutdown of the recovery vehicle. Figure 4.17.5.1 shows the high variability in crew removal of the barrier in the first three weeks of the test. Figure 4.17.5.2 shows that crew performance of shutdown of the vehicle was consistent. Figures 4.17.5.1 and 4.17.5.2 show that the variability and increased time to remove the barrier had little impact on the total time to shut down the vehicle. Removing the recovery barrier was conducted while other shutdown procedures were completed by other crewmen. Therefore, reducing the time required to prepare the vehicle for march or evacuation will be achieved by modifying equipment and procedures other than those for removing the recovery barrier.

Table 4.17.3. Overall Descriptive Statistics for Removing the Recovery Barrier and Shutdown of the Vehicle

22_CTA0066 FROM 87018 TO 87087
REMOVE AND STOW
THE RECOVERY BARRIER

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	81	SUM WGTS	81	100% MAX	26.0333	99%	26.0333	0	18.4
MEAN	5.16646	SUM	418.483	75% Q3	7.425	95%	20.68	0.0166667	20.9333
STD DEV	6.33846	VARIANCE	40.1761	50% MED	2.15	90%	15.4233	0.216667	21.85
SKEWNESS	1.7028	KURTOSIS	2.12673	25% Q1	1.375	10%	0.473333	0.25	25.6333
USS	5376.17	CSS	3214.09	0% MIN	0	5%	0.26	0.35	26.0333
CV	122.685	STD MEAN	0.704274			1%	0		
T:MEAN=0	7.33587	PROB>|T|	0.0001	RANGE	26.0333				
SGN RANK	1620	PROB>|S|	0.0001	Q3-Q1	6.05				
NUM ¬= 0	80			MODE	0.583333				
D:NORMAL	0.293005	PROB>D	<0.01						

23_CTA0067 FROM 87018 TO 87087
SHUTDOWN RECOVERY VEHICLE

SCORES FOR TOT_MIN >60 DELETED

UNIVARIATE

VARIABLE=TOT_MIN

MOMENTS				QUANTILES(DEF=4)				EXTREMES	
								LOWEST	HIGHEST
N	78	SUM WGTS	78	100% MAX	58.9833	99%	58.9833	4.5	23.85
MEAN	14.5406	SUM	1134.17	75% Q3	17.4583	95%	26.085	5.85	26.0167
STD DEV	7.46149	VARIANCE	55.6738	50% MED	13.2	90%	22.06	6.8	27.3833
SKEWNESS	3.22736	KURTOSIS	16.2024	25% Q1	10.3417	10%	8.18	7.1	36.9667
USS	20778.3	CSS	4286.88	0% MIN	4.5	5%	7.085	7.98333	58.9833
CV	51.3149	STD MEAN	0.844847			1%	4.5		
T:MEAN=0	17.2109	PROB>|T|	0.0001	RANGE	54.4833				
SGN RANK	1540.5	PROB>|S|	0.0001	Q3-Q1	7.11666				
NUM ¬= 0	78			MODE	8.15				
D:NORMAL	0.174357	PROB>D	<0.01						

Table 4.17.4.1. Mean Times to Remove the Recovery Barrier by Week of the Test

22_CTA0066 FROM 87018 TO 87087
REMOVE AND STOW
THE RECOVERY BARRIER

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	14	10.21	8.15	1.28	26.03	2.18	142.90	66.48	79.88
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	10.09	6.20	1.80	20.93	1.72	131.23	38.41	61.39
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	10.67	8.18	1.93	21.85	3.34	64.00	66.96	76.72
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	2.98	3.85	0.50	10.70	1.57	17.88	14.84	129.26
WEEK=WK5: 15-21 FEB									
TOT_MIN	3	0.67	0.64	0.25	1.40	0.37	2.00	0.41	95.56
WEEK=WK6: 22-28 FEB									
TOT_MIN	1	1.13	.	1.13	1.13	.	1.13	.	.
WEEK=WK7: 1-7 MAR									
TOT_MIN	18	1.45	0.91	0	3.48	0.21	26.12	0.83	62.74
WEEK=WK8: 8-14 MAR									
TOT_MIN	10	1.30	0.88	0.02	2.73	0.28	13.03	0.77	67.29
WEEK=WK9: 15-21 MAR									
TOT_MIN	10	2.02	0.54	1.13	2.92	0.17	20.18	0.30	26.94

Figure 4.17.5.2. Box and whisker plots for shutdown of the recovery vehicle trials.

Figure 4.17.5.1 Box and whisker plots for removal of the recovery barrier trials.

Table 4.17.4.2. Mean Times to Shutdown the Recovery Vehicle by Week of the Test

23_CTA0067 FROM 87018 TO 87087
SHUTDOWN RECOVERY VEHICLE

VARIABLE	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM	VARIANCE	C.V.
WEEK=WK1: 18-24 JAN									
TOT_MIN	14	12.04	4.34	8.15	22.15	1.16	168.50	18.82	36.05
WEEK=WK2: 25-31 JAN									
TOT_MIN	13	14.39	5.76	5.85	27.38	1.60	187.02	33.13	40.01
WEEK=WK3: 1-7 FEB									
TOT_MIN	6	15.24	6.25	8.18	26.02	2.55	91.47	39.04	40.99
WEEK=WK4: 8-14 FEB									
TOT_MIN	6	17.74	9.71	10.93	36.97	3.96	106.47	94.22	54.70
WEEK=WK5: 15-21 FEB									
TOT_MIN	3	12.49	1.14	11.77	13.80	0.66	37.47	1.29	9.11
WEEK=WK6: 22-28 FEB									
TOT_MIN	1	23.85	.	23.85	23.85	.	23.85	.	.
WEEK=WK7: 1-7 MAR									
TOT_MIN	18	292.94	1175.20	6.80	5001.67	277.00	5272.87	1381096.26	401.18
WEEK=WK8: 8-14 MAR									
TOT_MIN	9	12.78	5.85	4.50	20.72	1.95	114.98	34.21	45.78
WEEK=WK9: 15-21 MAR									
TOT_MIN	10	25.40	33.74	8.43	120.82	10.67	254.03	1138.25	132.81

4.17.6 Factors affecting 22_CTA0066 Remove recovery net:

A. Procedural Considerations

In some cases the recovery net is folded on wet ground. When the net storage compartment is also wet, due to existing conditions, the potential exists for deploying the net with the additional water weight. Possibly there are implications here for compensatory brake settings to allow for this added weight. Also, the effect of wet storage and wet use for recovery on the life cycle of the net is unknown. The net might be folded after being layed on a tarp for its protection.

4.17.7 Factors affecting 23_CTA0067 Shut down recovery subsystem:

A. Procedural Considerations

Transport fixture becomes hard to remove when hydraulic pressure has been bled off. Barrier structure is prepared for transport with hydraulic pressure present. If the fixture is installed when pressure is present, then structure is not in a natural resting position and sags against the fixture when pressure is removed. This condition causes a binding between structure and fixture.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Hydraulic leaks that go undetected cause a loss of hydraulic fluids and, consequently, barrier deployment and recovery problems;

2. Failure of crewmen or ground observers to ensure that pulleys, cables, the net, hydraulic lines, etc., are free and properly positioned to prevent equipment damage; and

3. Failure to ensure that the truck engine is at the proper RPM for maintaining hydraulic pressure at the required level.

C. Safety/Health Hazard

Crewmen frequently walk on the folded barrier structure to inspect cables and hydraulic lines. No non-slip surfaces are provided. No safe walkway exists.

D. Maintenance

Several of the flexible hydraulic lines routed on the side opposite the RGA camera on the barrier structure are linked together with plastic tie wraps. These ties break and there is a potential for equipment damage.

Note: This was observed happening by crewmen. One of the lines fell down when the tie broke and a line was cut.

E. Potential Solutions

1. A more substantial set of safety rails or chains should be designed to protect the operator from falls while deploying or retracting the barrier.

2. A means, either electromechanical or observational, should be added to inform the operator when the barrier is fully extended or retracted. The sounds from the hydraulics may be severely attenuated by ambient noise, especially if the operator is in MOPP IV gear.

4.18 24_CTA0027 Fueling and defueling AV.

4.18.1 Procedural reference:

a. DEP 55-1550-200-CL-8 pages N-3 through N-4
b. TM 55-1550-200

4.18.2 The task of fueling and defueling the AV was repeatedly interrupted by mechanical difficulties with the fuel service pump. The difficulties encountered when using the fuel service pump resulted in the pump being used infrequently as prescribed in the procedures. Thus, collecting a timed measure of the task was not practical.

4.18.3 Factors affecting 24_CTA0027 Fueling and defueling AV:

A. Procedural Considerations

Note: It was apparent during interviews that the fuel service unit (FSU) was disliked intensely by the crewmen. They reported problems in both fueling and defueling. There were 27 fueling/defueling incidents during the record trials, most of which were scored as either "H" for hardware or "D" for dependent. However, some of these incidents were attributed to problems within the AV rather than the FSU. An undetermined number of additional minor problems, which caused delays, were not reported as RAM incidents because maintenance personnel were not called. For example, a MANPRINT team member observed one such incident on 87050. Crewmen could not fully fuel the AV, but after partially defueling and refueling a number of times, the AV was filled. Crewmen reported problems with keeping the pump primed. They also reported that they suspected that the original problem was caused by either air in the fuel bladder or a crimp in the bladder. Since the incident was not reported and no maintenance performed, the actual cause was not determined.

1. The AV was not always fueled on the support stand as it was occasionally moved directly from the container to the launcher.

2. Due to the number of problems encountered, new preventative maintenance and diagnosis procedures may need to be developed.

3. The fuel service may become a serious problem under tactical conditions. With the numerous FSU problems encountered, it is conceivable that during battle the battery fuel pump could fail and parts resupply may not be available. AVs would not be available for service.

B. Potential Errors

Crewmen reported the following actual or potential errors:

1. Not turning the fuel/defuel valve to the correct position;

2. Not turning the pump handle in the correct direction; and

3. Mixing fuel and oil in wrong proportions.

C. Training Implications

1. The importance of PMCS should be expanded and emphasized to reduce the number of incidents caused by commonly observed problems and crewmen inattention.

2. Maintenance personnel should receive more training in fuel system malfunction diagnosis. Several incidents were reported during OT II in which the cause of the malfunction could not be determined by maintenance personnel.

3. Maintenance personnel training should stress the use of proper tools to prevent damage to equipment. (Additional comments in this regard are included under the Maintenance section of this CTA.)

D. Human Engineering Considerations

1. The fuel sight gauge is near the bottom of the FSU, forcing the operator to kneel or sit and bend over to obtain accurate readings.

2. The fuel sight gauge is difficult to read at night with the red lens flashlight, making fueling/defueling difficult.

3. The pump handle is near the bed of the AVH, forcing the operator to kneel or sit on some readily available object in order to operate the pump.

4. The fuel valve lever has loosened up during use.

5. The workspace around the overflow vent on the AV is limited when the AV is fueled on the launcher, increasing the probability of personnel injuring themselves from falling. This would not be the case if the AV were always fueled on the support stand.

6. At times the pump crank was very difficult to operate. Operators spelled each other due to fatigue from operating the pump. For some such incidents, maintenance personnel were unable to determine the cause.

7. Reportedly, defueling the AV too rapidly builds air pressure in the FSU reservoir which blows the cap off and spills fuel. Only one incident was included in the RAM data, but operators stated this happened more than once.

E. Safety/Health Hazard

1. The FSU pump leaks and spills fuel on the AVH bed, which increases a fire hazard.

2. Fumes from spilled fuel nauseate the pump operator.

3. Rapid defueling reportedly caused the cap to blow off, splashing fuel on the operator. This was reported to happen frequently.

4. The FSU weighs more than may be necessary and is difficult to move or lift.

F. Maintenance

1. Personnel were observed changing the fuel filter in the AV, employing an adjustable crescent wrench. The -20 technical manual calls for the use of the ratchet with the 6-inch extender and the 11/16ths-inch crowfoot. The nut also should be torqued to 85-95 inch pounds. It is not known whether the proper tools were misplaced, being used elsewhere, or whether the personnel lacked adequate training in maintenance procedures.

2. No spare pumps for the FSUs are in the Battery inventory. During wartime, this could render the Battery at least temporarily inoperable if all units failed at the same time. Spares should be added to the inventory for quick replacement at critical times.

G. Potential Solutions

1. Considering the number and extent of problems encountered in fueling and defueling, a complete redesign of the FSU seems warranted. One crewman suggestion provided was to suspend a fuel tank which could be pressurized beneath the launch vehicle. This could be equipped with a metering system similar to those used in a service station. This would not solve the defueling problems, and could create additional problems in maintenance, but the concept is valid. Another suggestion was to provide an electric or hydraulic pump to ease the physical burden on the crew. A backup provision employing a crank could ensure operability.

2. The crank and gauge should be placed in more convenient locations well above the bed of the AVH.

4.19 25_CTA0101 Perform emergency hydraulic slave for recovery launch subsystem.

4.19.1 The emergency hydraulic slave of the launcher was conducted as an end-of-test demonstration. The recovery vehicle was to be slaved to the launcher. The launcher's hydraulic pump was declared to have failed and the slave procedures were recorded as a RAM incident. The demonstration lasted 59 minutes before the launcher's hydraulic pump cracked and broke apart. The failure occurred after the two hydraulic flexible hoses had been connected to both vehicles and the recovery vehicle's hydraulic system had been activated.

4.19.2 Factors affecting 25_CTA 0101 Perform emergency hydraulic slave for recovery launch subsystem:

A. Procedural Considerations

1. The recovery barrier may not be able to be fully deployed when the recovery vehicle is parked next to the launcher.

2. The hydraulic slave valves are located in a position that makes bending and aligning the hoses a difficult and time-consuming task.

3. Lay the hoses down the centerline of the first truck to which the hoses are to be connected. This eliminates bending the hoses for one installation.

B. Potential Errors

1. Not ensuring that slave hydraulic line gaskets are seated prior to connection.

2. Not ensuring that the slave hydraulic lines are free from foreign objects.

3. Not positioning both vehicles so that they accommodate the length of the slave cables.

4. Not considering the swing-out clearance of the recovery barrier structure when the recovery system is the slave and the launcher is the master.

5. Not protecting exposed portions of the body from hydraulic oil spray when attempting to connect slave lines.

6. Not providing extra oil so that when the slave lines are pressurized the reservoir can be filled to the proper level before operations.

7. Not providing cleaning material to remove oil from exposed portions of the body.

C. Training Implications

1. The comments in B, above, all have implications for being stressed in the training environment. Hands-on training in this area is inappropriate for unskilled personnel.

2. Training on the characteristics of hydraulic systems is an imperative. The operators must have a complete appreciation of what the implications of each of their actions are with regard to this task.

D. Manpower Implications

1. Potentially, manpower could be reduced if the hydraulic slave system valve were repositioned.

2. (See solutions below.)

E. Human Engineering Considerations

1. The hydraulic slave valves are located underneath the bed of each truck, causing the operator to work in a strained and unnatural position when connecting the hydraulic lines.

2. The "O" rings that fit in each end of the slave lines are difficult, if not next to impossible, to seat. "O" ring appears not to be part of the line or the valve.

3. The stiffness of the slave lines restrict bending to the point that feeding them around other equipment appendages, e.g., drive shaft and under body of the vehicle, is substantially inhibited and interferes with the coupling procedures. In those instances where the operator's hands have become wet with hydraulic oil, the task is impossible to perform until he and the lines are cleaned. Loss of oil occurs as soon as the operator opens the cap at the slave connection point.

4. Currently, the operator must lie on the ground, on his back, or stoop and crouch in various positions to get the job done.

F. Safety/Health Hazard

1. Hydraulic oil (hot or cold) can splash into an operator's eyes.

2. In extremely cold weather, the operator's hands could stick to the bare metal parts and cause injury.

G. Potential Solutions

1. Move the hydraulic slaving mechanism to a position on the vehicle that will allow the operator to perform the task in a standing up position. Positioning the valves on the side of the vehicles would allow rapid installation, less hose bending, and more distance between vehicles.

2. Ensure that the slave hydraulic lines are equipped with truly quick disconnect fittings on both ends.

3. Increase the overall length of the slave hydraulic lines if the hydraulic slave valves remain in the present location.

4.20 Critical task review of MOPP conditions.

4.21 Table 4.21 lists the means for task trials conducted under MOPP I, II, and IV simulated conditions. The minimum significance difference and t test values are provided for review. The statistical test should be viewed with caution as the operational test conditions did not meet the assumptions required for the analysis of variance. Review of the table clearly indicated that no conclusions can be drawn from the timed measures concerning the effect of MOPP uniforms on task performance. Crewmen were not issued properly fitting MOPP garments and frequently would not wear their items, such as gloves, boots, or hoods.

4.22 During test, several observations were made of crew tasks conducted during MOPP trials and included:

a. The safety pins on the recovery vehicles' swing back pulleys could not be opened or closed while crewmen wore MOPP gloves. The pins were likely to puncture loose fitting gloves.

b. The cables of the recovery barrier support structure were extremely difficult for crewmen to inspect while wearing MOPP masks under low light conditions.

c. Assembling the AV was difficult to do under MOPP conditions as so many small parts must be handled by crewmen.

d. The launch officer had difficulty hearing and speaking while wearing the MOPP hood when transmitting to the GCS.

e. Equipment in the GCS was struck by crewmen wearing MOPP masks on their hips. In one case, the disk drives were accidentally turned off when struck by a mask.

f. The walking surfaces of the launcher, AVH, and recovery vehicles were slippery for crewmen wearing MOPP boots.

g. The keys of the DMD keyboard in the GCS were difficult for crewmen to press while wearing the MOPP gloves.

h. Climbing to the top of the GCS to install antennas while crewmen wore MOPP uniforms was dangerous.

i. The RGA stabilizer leg pads were difficult to unstrap while crewmen wore MOPP gloves.

Table 4.21. Mean Times to Perform Tasks under MOPP Conditions

Critical Task	Mean MOPP I	Trials (N)	Mean MOPP II	Trials (N)	Mean MOPP IV	Trials (N)	Minimum Significant Difference	t Value Alpha=.05
Emplacement of GCS	29.2	66	35.2	7	28.1	3	25.3	NA
Emplacement of launch subsystem	08.4	77	*		21.6	2	10.4	1.9
Emplacement of recovery subsystem	02.3	75	02.3	4	02.4	1	03.0	NA
Emplacement of remote ground terminal (RGT)	48.3	54	45.2	6	30.1	3	26.1	NA
Install/stow fiber optics cables Install	19.9	43	15.2	4	14.6	3	14.9	NA
Stow	24.8	56	21.6	5	31.3	3	23.1	NA
Prepare recovery subsystem for recovery	40.2	75	27.4	4	40.7	1	72.7	NA
Deploy recovery subsystem barrier support structure	08.9	76	08.2	4	5.9	1	12.8	NA
Remove AV from container to AV support stand	08.1	118	06.6	2	*		10.9	NA
Move AV from support stand to launch subsystem	05.8	101	10.7	2	*		03.6	2.0
Prelaunch operations	71.9	77	94.0	5	*		82.5	NA
Prepare, enter, and verify AV mission plan	33.4	164	31.1	18	*		60.3	NA
Perform launch operation of AV	08.9	177	08.7	5	*		01.3	NA
Perform handoff	02.0	124	02.8	3	*		00.8	NA
Operate mission payload system in track mode for Copperhead		No MOPP II or IV Trials						
Perform artillery adjust-conventional munitions		No MOPP II or IV Trials						
Perform damage assessment		No MOPP II or IV Trials						
Lost link reacquisition	05.8	17	03.9	4	*		07.8	NA
Perform AV recovery	52.7	74	40.6	4	58.5	1	76.4	NA
Remove recovery net	05.4	76	02.1	4	01.1	1	10.7	NA
Shutdown recovery subsystem	14.6	73	12.6	4	20.7	1	17.4	NA

5.0 TRAINING, MANPOWER, AND ORGANIZATIONAL CONSIDERATIONS

5.1 Training, Manpower, and Organizational findings for the RPV system are provided in a series of tables. The tables list the issue discussed, the source of the comments, and the comments or recommendations that were made by the source(s). The tables include:

a. Table 5.1.1. Training Area Content: Manpower and Personnel Implications

b. Table 5.1.2. Operational/Tactical Impact

c. Table 5.1.3. Training Area Content: Operational Interfaces

d. Table 5.1.4. RPV Operational/Training Issues

e. Table 5.1.5. Training Area Content: Communications

f. Table 5.1.6. Training Aids/Devices/Simulators

g. Table 5.1.7. Training Area Content: RPV Maintenance

h. Table 5.1.8. RPV Battery Training Notes

i. Table 5.1.9. Training Area Content: RPV Video Imagery

j. Table 5.1.10. RPV Battery Comments Taken from the Critical Task Analysis Responses

Table 5.1.1. Training Area Content: Manpower and Personnel Implications

Issues/Findings	Source	Comments/Recommendations
Survey capability is not adequate for RPV battery.	DTAC DIVARTY	Battery needs its own PADS system, maybe two.
Brigade S-2 section staffing needs to be changed.	DIVARTY	Brigade/Division TOCs require a person to monitor the remote video.
FLIR imagery payloads will require extra personnel.	DIVARTY DTAC Observation	Additional personnel will be required at the battery to maintain a 24-hour, 7-day week capability. Brigade/Division TOCs will also require additional people.
Maintaining a microwave or landline between RPV and TOC.	DIVARTY	Either way would increase the manpower requirements and the personnel are not on the unit MTOE.
RPV needs a target list from FSO. Cannot do it over the radio.	DIVARTY	May require two mission commanders, one flying and one back at Brigade. A third person may be required.
An image interpreter may be required with each GCS/FCS and Division/Brigade TOC.	DTAC DIVARTY	95D MOSs may be needed to man stations within the RPV system.
The forward TOCs require a person responsible for maintaining communications with the RPV battery.	DTAC	Assign an MI Bn liaison officer with his own vehicle and radios. Would be responsible for commo with RPV battery, receiving mission orders, etc.
Sustainment of RPV as it relates to Corps and Division.	DTAC	Part of this problem is the dispersion of the RPV sections. Further testing in an operational environment will provide data for these types of decisions.
A Contact Team of 2-3 people should be assigned to each RPV battery for maintenance support of vehicles, etc.	DTAC	The Contact Team must be fully self-sufficient and have its own vehicle (M113).

Table 5.1.1. Training Area Content: Manpower and Personnel Implications (cont'd)

Issues/Findings	Source	Comments/Recommehdations
Composition of GCS/FCS personnel needs to be determined to capitalize on RPV capabilities.	DTAC Observation	A determination of what they need to know in order to interface with artillery, maneuver units, and military intelligence.
The use of landlines has been suggested to improve communications security and operations between the RPV and TOC.	DIVARTY DTAC	This would required additional manpower to lay the lines and guards to secure the lines.
One maintenance shelter could handle only one CLRS.	CTA	More maintenance support is required. Manpower needs to be determined.
Insufficient personnel for perimeter security.	Observation	One suggestion was to site the RPV components within or near that can provide security.
Cables at the GCS/FCS were run over.	Observation	There is no one at these sections to control traffic.

Table 5.1.2. Operational/Tactical Impact

Issues/Findings	Source	Comments/Recommendations
Survivability of the AV has to be weighed against flying at a lower altitude and getting usable information.	DIVARTY	The purpose of the RPV is to find out what is out there.
Capability of the Brigade has to influence a given area.	DIVARTY	The question to ask is "what does the RPV have the capability to influence?" That is, what it should fly first?
Timeliness of the RPV is essential.	DIVARTY	RPV needs to be time-sensitive with the battle. Leave it on the launch rail if it is not ready.
What are the interactions between Corps, Division, and RPV if FCS is flying someone else's mission? How does the maneuver unit get involved in this type of situation?	DIVARTY	These are some of the things to be worked out in future field operations.
Firing unit should indicate response time for firing.	DIVARTY	If time is too great, RPV section would have the option to end the mission and give target(s) to some other unit or accept partial rounds.
RPV leadership personnel need to know the whole environment in which they are operating.	DIVARTY	They need to have the whole operations order.
RPV should have the knowledge of the type of unit to which it is assigned.	DIVARTY	RPV personnel need to be trained in the tactical operations of whatever Division they support.
Need a small vehicle to retrieve returned AVs.	Interview Observation	If the AV handler leaves there is no way to handle the AVs. A small vehicle is needed to retrieve or
If the maintenance shelter is co-located with a full battery there would be no way to evacuate the AVs in an emergency.	Interview	This can be investigated in future field tests.
Fiber optics are a problem around a combat TOC.	DIVARTY	The best solution would be to eliminate fiber optics completely. Coaxial cable would be a better protection than the present covering.

Table 5.1.3. Training Area Content: Operational Interfaces

Issues/Findings	Source	Comments/Recommendations
Mission commander and battery commander lacked knowledge of air/land battle.	DTAC DIVARTY	Training is required in the following areas: a) Leadership b) Air/land battle doctrine as it applies to a heavy armor division c) How the Division fights d) Understanding of what the Division and Brigade commanders' intent is.
Lack of ability to make the decisions on what to look for.	DTAC DIVARTY	Integration of RPV unit with the unit it is supporting needs to be trained.
Lack of communications with staff of the supported unit.	DTAC DIVARTY	Training on how to interface with the supported unit, maneuvers, artillery, MI.
Battery commander and mission commanders need to have their job duties redefined.	DTAC DIVARTY	A task and skill analysis of both jobs in a combat environment should be developed.
Lack of understanding in what is required when planning and developing a mission for the supported unit.	DTAC DIVARTY	Training in interaction at each command level is required. The RPV unit in this test was not trained in this integration.
The rules of engagement for the OT II was to deal directly with the mission commander. This policy was not to the liking of the supported units.	DTAC	There were strong opinions that the supported unit commanders should deal directly with the battery commander, rather than "a second in command."
What happens when the Threat is moving and the RPV is not ready to launch?	DIVARTY	Mission planning may have to be revamped.
Mission preplanning starts with the Division G-2.	DIVARTY DTAC	Felt that the RPV would be handled by the Division G-2.

Table 5.1.3. Training Area Content: Operational Interfaces (cont'd)

Issues/Findings	Source	Comments/Recommendations
Operation of RPV requires more face-to-face interaction.	DIVARTY DTAC	This was pointed out as a serious deficiency. These interactions need to be documented and trained.
Need to identify the basic tasks required to interface.	DIVARTY DTAC	An interaction task analysis is required, based on actual field operations.

Table 5.1.4. RPV Operational/Training Issues

Issues/Findings	Source	Comments/Recommendations
Interpretation of real time imagery does not exist in the service today.	DIVARTY Observation	The 96D MOS and the Order of Battle Technician do not have the best fundamental imagery interpretation basics to begin working with. This is a unique skill area.
RPV operators need to be able to make tactical decisions based on Order of Battle techniques, commander's intent, and the relationship between targets, if any relationships exists.	DTAC DIVARTY Observation	These things need to be incorporated into a training program for the RPV image interpreter.
Video monitors in the TOCs would not enhance the combat power of the RPV but may well cause manpower and maintenance challenges beyond current TOC management.	Observation	The use of remote monitors needs to be tested in a field environment such as NTC, or large scale maneuvers.
Imaging system is of concern due to the small percentage of stationary targets detected.	DTAC	This needs to be judged based on the data available in the OT II data base.
During the conduct of a reconnaissance mission there was concern about what search techniques are best to employ.	DTAC	The data base may provide some insights into this problem. Further investigation of this should be addressed in future field testing.
A person should be assigned to the forward TOC and be responsible for receiving mission orders and any other commo between the RPV and supported unit.	DTAC	Possibly a MI Bn liaison with his own vehicle and radios. Would communicate with the RPV on an internal net.
RPV vehicles and equipment need to be military hardened.	DTAC	Equipment is too fragile to survive in a combat environment. The GCS/FCS vans need to be able to damaged.

Table 5.1.4. RPV Operational/Training Issues (cont'd)

Issues/Findings	Source	Comments/Recommendations
RPV vehicles and equipment need to be capable of being airlifted.	DTAC	The next war will be a come as you are war and the RPV must be able to go with the Division, otherwise it will arrive too late.
The BOC is a non-functioning entity. His function has not been adequately addressed.	DTAC	Battery commander needs to be up with the DTAC Provide him with an M113, three radio nets, driver, RTO or 91/96 MOS, and a trained FO. The Battery commander could interpret what is going on and provide the information to the DTAC.
Lack of adequate doctrine that articulates to the degree necessary how sustainment operations will be conducted for the FCS, Battery, from Corps to Division areas.	DTAC	This is a possible manpower problem.
There should be a PUSH package that comes from Corps to Division.	DTAC	The package should be like a Contact Team and have some GS maintenance with it. The team would carry high-turnover repair items. Must have the capability to be self-sufficient.
Each FCS should be able to launch and be under control of its supporting unit.	DTAC	BOC would become maintenance and support.
Each Brigade should have its own CLRS.	DTAC	CLRS in the rear could recover for forward FCSs. ObservationWould make maintenance easier. If there was a way to recover the AV without having a retriever, it would cut down on equipment.
There were times we could not get link between FCS and CLRS.	DTAC	Ordered CLRS to fly the mission and turned it into a Division flight. This extended the mission time and range, due to not having to handoff.

Table [illegible].1.4. RPV Operational/Training Issues (cont'd)

Issues/Findings	Source	Comments/Recommendations
It would be better to have four CLRS, three up and one back with the DTAC.	DTAC Observation	This organizational setup would provide redundancy and reliability to perform missions.
RPV by doctrine during the OT worked for DIVARTY and the DTAC.	Observation	Maybe the doctrine should be turned around; the FCS for the Division missions and CLRS for Brigade missions.
Trafficability: The vehicle in the RPV must match the mobility of a heavy armor division.	DIVARTY	Brigade TOC had to select a site that was compatible for the RPV. Recommended that the RPV components be mounted on M548s or Hemmet vehicles.
Impact of Multiple Subscriber System (MSE) on RPV. How does RPV interface with a unit that has MSE?	DIVARTY	What impact MSE will have is unknown at the moment.
Critical to have remote video in the TOC.	DIVARTY	A remote video would provide real time imagery interpretation and provide target information for the artillery.

Table 5.1.5. Training Area Content: Communications

Issues/Findings	Source	Comments/Recommendations
Failure of the battery to understand how to work in a secure mode.	DTAC	This should be stressed in the RPV training.
Failure to perform proper PMCS maintenance on the radios.	DTAC	Additional emphasis on maintenance is required or additional radio repairman are needed.
Lack of proper radio procedures.	DTAC	More training is needed on the procedural tasks.
Lack of good grounding practice resulted in a number of failures.	DTAC	Training on proper methods of grounding needed to be stressed.
CLRS could not stay in contact with supported unit.	DTAC Observation	Training is required in site selection to optimize radio communications. more use of the OE-254 long range antenna should have been made. The battery needs more radios.

Table 5.1.6. Training Aids/Devices/Simulators

Issues/Findings	Source	Comments/Recommendations
Procedural training for RPV operators is required for initial as well as sustainment training.	DIVARTY	Crewmen need the practice in order to maintain their proficiency.
Embedded training for operators needs to be investigated.	DIVARTY	Recognition and identification training is one of the better training areas for this type of training.
Job aids to assist the AV handlers in preflight inspections are needed.	Interview	Inspection and standards lists are needed.
Job aids for inspection of the Retriever vehicle are needed.	Interview	Inspection and standards lists are needed.
Crosstraining programs are required.	Interview	It is extremely difficult to conduct crosstraning due to the diversity of RPV jobs. Training is additionally different under field conditions.
Training Interface Unit.	Interview	If the TIU were mounted in a van, it could be used in the field during down time. Could simulate the actual mission being flown.
Use of audiovisual aids.	Interview	More use should have been made of audiovisual aids during the training.

Table 5.1.7. Training Area Content: RPV Maintenance

Issues/Findings	Source	Comments/Recommendations
Concern over the maintainability of the RPV vehicles when all the Division's vehicles are employed.	DTAC	The maintenance at the DS and GS levels need to be exercised in actual field maneuvers to provide this data.
The battery should be able to test the GCS/FCS as a complete system.	Interview	This concept needs further investigation.
An organizational "quick fix" capability is needed.	Interview	Emergency repair kits could be provided for the battery vehicles. The idea of a Contact Team was also advocated.
The maintenance training was not that good.	Interview	Felt that the instructors were learning along with the students.
Troubleshooting procedures should start with a system approach.	Interview	Once 10-10-5 is done away with, the only starting point for troubleshooting is one of subsystems.
There are built-in tests for the equipment that provide no readout to the crewmen.	Interview	Test results should be provided to the crew personnel.
Binary readout codes must be translated and are time consuming.	Interview	System needs to be more user friendly. Too many ways to make a mistake.
Lack of adequate tools.	Interview	A needs assessment of the organizational tool box is required.
Metric hydraulic lines and fittings.	Interview	Not supportable by the Army Maintenance System. No facilities for fabricating metric lines.
Inadequate kelvar repairs to the AV.	Interview	Equipment is not available and is poorly supported.
Maintenance help at the battery level is required.	Interview	Warrant officers/E7s tend to get specialized at the mission planning level. They have had maintenance training and should be used to assist in maintenance performance.

Table 5.1.8. RPV Battery Training Notes

Issues/Findings	Source	Comments/Recommendations
Mission payload operator training.	Interview	Felt very confident after flying five actual missions.
Failure to use brightness and contrast controls during mission to optimize the video imagery.	Interview	A thermal sight adjustment program was developed for the TTS and TIS tank thermal sights. It was discovered that a training program in adjusting the brightness and contrast control aided in better recognition and identification of targets. The same thing may help with the RPV.
Training Interface Unit is good for procedural training.	Interview	Not good once a live mission is fown. The computer generated imagery is considered to be unrealistic and inadequate for training recognition and identification.
Operators did not know what to look for or how to detect camouflaged targets.	Interview	This may improve by using the video imagery taken from the OT II test. There is no standard R&I program that has been developed by the Artillery School. A prototype program was developed and tested at the Artillery School in 1983.
RGT training should require only one week of training.	Interview	Interviews with the RGT crewmen indicated that the RGT was not that difficult a component to learn.
Mission planning as a task in itself was not viewed as difficult to learn.	Interview	Interfacing with the Division staff seems to be an identified problem. RPV control stations did not receive this type of training.
Higher skill levels are required for manning the GCS/FCS.	Interview	Essentially, they are considered a flight crew. They must plan and fly the mission.
GCS/FCS operators should be trained to assist the maintenance personnel.	Interview	They know the system and could be invaluable to the maintenance personnel.

Table 5.1.8. RPV Battery Training Notes (cont'd)

Issues/Findings	Source	Comments/Recommendations
Estimated training time for GCS/FCS operators.	Interview	Six months of training was felt to be adequate.
Camouflage:		
a) Crews did not use existing natural cover and concealment.	DTAC Observation	No operating section took advantage of natural cover and concealment.
b) CLRS must use cover, camouflage, light discipline all the time.	Observation	
c) Battery command emphasis was placed on using the nets.	Interview	
d) Launch and recovery could have been made near treelines.	DTAC	
e) All launch and recovery was made in the open.	DTAC	Launch vehicle could launch from a hide position. Need training in this technique.
Selection and emplacement of RPV sites: a) Selection of routes b) Tactical emplacement of vehicles and equipment c) Electrical grounding of vehicles and equipment d) Camouflage techniques e) Effects of camouflage nets on antennas f) Directional characteristics of radio antennas	CTA	All of these issues came to light as a result of the Critical Task Analysis.

Table 5.1.8. RPV Battery Training Notes (cont'd)

Issues/Findings	Source	Comments/Recommendations
Map reading skills are essential for the RPV battery.	Interview	The ability to read a map is essential for determining platoon and company hide areas for threat as well as the battery itself.
Failure to follow proper procedures for requesting and adjusting fire for artillery.	DTAC Observation	The RPV gunnery is based on a 6400 mil direction and must be used during the call for fire by voice and digitally. If the requestor is on the ground or on a moving platform, the observer's target direction could be something other than 6400 mils.
Additional training time is needed to teach HE fire adjustment and Copperhead against moving target.	Interview	Additional live rounds may be required. A training simulator for teaching these skills would reduce cost of live round firing and maximize actual firing training.
Observers need to be able to see what HE/Copperhead fires look like when fired at targets.	Interview	Observers need to know what to expect when they call for and adjust artillery fires.
Most of the outside jobs can be taught OJT.	Interview	If this is so, a short familiarization course followed by OJT would reduce training time and increase time spent in a unit. Crewmen felt that the most worthwhile training they had received was OJT.
A two-week OJT survey course for RPV would provide an understanding of the concepts and performance required for RPV training.	Interview	This would save time and maximize the time spent in the unit as well as conserving formal school assets.
Operators need to be trained to maintain their orientation while viewing the monitor.	Interview	A display reading should be provided to indicate flight path and payload direction of search. Fundamental map reading skills are also needed.

Table 5.1.9. Training Area Content: RPV Video Imagery

Issues/Findings	Source	Comments/Recommendations
Operators cannot detect, recognize and identify targets with present image quality.	DIVARTY DTAC	Video upgrade is paramount. Image quality varied greatly. Must be able to identify by most common Interviewname or correct alphanumeric designation.
Observers were untrained.	DIVARTY DTAC	Training received was targets at ground level. No look down angle.
What type of training should observers receive?	DIVARTY DTAC	Should receive basic FIST training. Understand TACFIRE.
Unable to detect camouflaged targets.	DTAC	Training should stress identification of camouflaged Interviewtargets, especially Regimental/Division command posts.
What are the best methods for search? What methods do the mission commanders use?	DIVARTY DTAC	How do we ensure that all possible targets are detected? Need to identify the best angle of degrees for payload to look for targets, and how to use the different FOVs to optimize target detection.
Thermal target recognition and identification will be required.	DIVARTY DTAC	Thermal training programs will need to be developed.
There is a need to provide the Division and Brigades with a low level intelligence analysis not just report targets.	DIVARTY DTAC	The RPV battery needs to be trained to provide a quick intelligence type of product based on their flights.
RPV operators should be trained to recognize and identify targets in different types of geographical environments.	DTAC	The RPV that would be assigned to the 1st Cavalry Division should be trained to recognize and identify targets in a European environment because that is the area the 1st Cav is assigned to go to.

Table 5.1.9. Training Area Content: RPV Video Imagery (cont'd)

Issues/Findings	Source	Comments/Recommendations
Training time needs to be allocated for R&I training.	DTAC Interview	Investigation into the area is needed.
Location of targets by using track and wheel signatures.	Interview	No comments.
Observers had difficulty in adjusting artillery from a video monitor, especially against moving target.	Interview	Additional training in requesting and adjusting HE and Copperhead is required. Need to determine what FOVs are best to use for adjusting artillery fires.
Realistic imagery is needed to train for Battle Damage Assessment.	Interview	No imagery is currently available.
Techniques for optimizing target detection.	Interview	Need to learn how to use sun angles and shadows to detect targets. Ways to avoid sun glare on the RPV's optics.

Table 5.1.10. RPV Battery Comments Taken From the Critical Task Analysis Responses

Equipment Training

- Additional generator training
- Use of the M2 Compass
- Alignment of RGT at Night
- Use of multimeter
- Transfer of the AV from stand to shuttle
- Hands-on Training for launch operations
- Using a conversion table when RV brake pressure guage does not work
- Disassembly/assembly of fuel pump
- Training recovery vehicle/launch vehicle slave procedure
- Correction of problems on deploying the barrier
- Practice for operating recovery controls

Checklist Procedures

- Setup procedures for GCS/FCS
- Setup procedures for RGT
- Inspect for hydraulic leaks on the recovery vehicle
- Comprehensive checklist for pre-op inspection for the recovery vehicle
- Checklist for lost link reacquisition

Requesting and Adjusting Artillery

- Training on plotting AV footprints
- Training on procedures for positioning AV on gun target line (GTL)
- Adjustment of fire from the video
- Fire procedures for laser guided projectiles

NBC

- Setting up RPV with MOPP gear
- Setting up BOC with MOPP gear
- Performing all tasks in MOPP gear

Miscellaneous

- Training emphasis on BIT/BITE checkout
- Improve typing speed for entering and verifying mission plan
- Correct laying of fiber optics

NOTE: The RPV crewmen recommended more training for each of the above tasks. In most cases additional training was specificed and in some cases new training would be required.

5.2 The organization and construction of technical manuals were reviewed during testing. Considerations for the technical manuals included:

a. The technical manual (TM) DEP 55-1550-200-10 series often refers to abbreviated procedures contained in the checklist DEP 55-1550-200-CL. The technical manuals are more detailed and should not refer to a less detailed checklist document. Further, if the abbreviated, less detailed procedure will suffice in explaining the task, then only that information should appear in the TM. This modification would reduce the number of pages that the operator would have to search and review in order to find the desired data.

b. In TM: DEP 55-1550-200-10-2, Task 2-17, Page 2-612, terms referring to the console display use such as rate step, frames per second, resolution and truncation ratio, may have little meaning for the operator in accomplishing his mission. In addition, it appears that AJ0-AJ6 carries with it the connotation that a rate step of good, better, or best resolution is achieved by manipulating the anti-jam mode switch.

c. A detailed analysis of TM: DEP 55-1550-200-10 series revealed the following potential errors. It was found that:

(1) The task information in many cases was obscured by numerous cautions, notes, and warnings to such a degree that they became interruptive and annoying to the operator.

(2) These manuals were heavy and bulky, making them hard to handle and store.

(3) Little or no consideration was given to information that was similar in nature and context and that could be printed in one place rather than repeated throughout the manual series.

(4) The manual provided a table/calibration chart "Brake Pressure Settings for Serial No. 1 through Serial No. 7" consisting of approximately 60 pages, when a brake pressure setting chart extract consisting of 3 or 4 pages would suffice for teaching purposes.

(5) Approximately 50 tasks were reviewed in the series of technical manuals. The procedural descriptions could be improved if consideration is given to the similarity of the contents and the redundant information reduced. Two examples include:

(a) Task 2-10, activate and checkout ground control station, and Task 2-11, ground control station shutdown, are similar. In fact, Task 2-11, ground control station shutdown, is the reverse of activate and checkout ground control station. These tasks could be combined by adding

a statement at the end of Task 2-10: Ground control station shutdown is accomplished by doing the reverse of activate and checkout ground control station.

(b) Task 2-12, ground control station march order, is the reverse of Task 2-9, emplace ground control station. These tasks could be combined by adding a statement at the end of Task 2-9: Ground control station march order is completed by doing the reverse of emplace ground control station.

(6) Procedural lists that could be consolidated and redundant information reduced include:

(a) Task 2-9, Emplace Ground Control Station

(b) Task 2-10, Activate and Checkout Ground Control Station

(c) Task 2-11, Ground Control Station Shutdown

(d) Task 2-12, Ground Control Station March Order

(e) Task 2-41, Emplace 30 kW Power Generators

(f) Task 2-42, Activate 30 kW Power Generators

(g) Task 2-43, 30 kW Generator March Order

(h) Task 2-44, Install MCPE and Protective Entrance

(i) Task 2-45, Activate and Checkout MCPE and Protective Entrance

(j) Task 2-46, MCPE and Protective Entrance Shutdown

6.0 MAINTAINABILITY REVIEW

6.1 Forty RAM incidents were reviewed that were scored either as an operator-induced problem or as a training deficiency. However, the incidents clearly had other contributory factors to consider. Table 6.1 presents the description of the RAM incidents from the RAM data collection forms and a MANPRINT review of the incidents.

6.2 Table 6.2 lists the results of the structured interviews for the maintainers and it follows the review of RAM incidents. The interview items provide the data requirement number for the appropriate items.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
M 40 002:86323115 Fiber Optics Connectors Site Setup	While connecting the fiber optics cable it was determined by the crew that the connector which connects the cable to the RGT was on backward. Crew did no maintenance action but notified mechanics of the problem. Cable was removed from RGT and exchanged, new cable was installed. After the original problem was diagnosed, ORG asked for DS support. DS responded by saying it was an ORG responsibility to remove the cable and exchange it. The notification procedures used added to the delay in this incident. The plate (label) marked TRANSMIT on fiber optics cable head was replaced with a RECEIVE label.	1. Other possible contributing factors: a) Score 6/Q: The cable head was labeled in the wrong location. b) TM does not specify which level of maintenance should repair. 2. Operator appeared to follow appropriate procedures.
M 30 002:863370645 Remote Interface Module During-OPS Check	During operations check RGT multi-rim fault was detected by BIT/BITE. Panel over interface module and the module itself were removed. The module was replaced. RAM scoring info: Later on 2407 at depot the part was not found to be the problem. It was a MICNS procedural problem.	Other considerations: a) Which maintenance TM should contain the procedural information (i.e., O, DS, GS, DEP). b) RGT software/hardware BIT/BITE should indicate the <u>most likely</u> fault first.
M 30 003:863371026 Fiber Optics Cable Post-OPS Check	During a flight run up, the RGT signal to GCS indicated a possible fiber optics cable fault. SGT Haas completed a fault isolation from the RGT local panel and a bad cable was indicated. ORG mechanic called and requested GCS to contact DS for replacement fiber optics cable. Cable was replaced. RAM DAG investigation information provided by Lockheed representative, 13 Jan 87. Per Mike Sepelyak the pin which was bent is recessed in the connector. An ND has a cover plate which protects the pin while not in use.	1. Other possible contributing factors: a) Score 6/H: Cable stowage location and method may be inappropriate for protection of cable heads. b) Score 6/Q: Material used for cable heads and cable may not be durable enough for a field environment. 2. Operator appeared to follow appropriate procedures.
M 30 005:863390810 MODEM During-OPS Check	During pre-operations checks of RGT system, faults in the MODEM were detected at 0730. They were not reported until 0810 because of communication gaps in relaying information. A MODEM was removed and replaced. The system was also tested by ORG mechanics and GCS control. SSG Jackson and SGT Moore went to the field site to test the RGT. It was then decided, because the RGT was not set up, that the RGT be brought back to the DS shop. The RGT arrived at the DS shop at approximately 1355 hrs. Test equipment was then set up and testing began at 1407 hrs. At 1635, a delay occurred because the DS mechanic did not have the two books they required to finish the test. At 1717 the delay was caused by the RGT being transferred to depot level maintenance.	Other considerations: 1. Score 6/E: The TMs (viewed as equipment) were not available at DS. 2. Score 6/T is viewed as appropriate if the TMs had been available but contained improper information.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
A 25 002:86341123 Air Data Terminal Launch	AV launch abort during launch sequence a MICNS fault came up on the teletype. Ran test 21, no faults noted. During engine runs links dropped. Block 20 data indicated bad GCS messages and ADT lock up and continuous monitor BIT. RAM DAG info: bad GCS message, ADT lock, continuous monitoring BIT. Commo between AV and GCS not complete.	Other possible contributing factors: 1. Score 6/V: It is unknown whether software was functioning properly. 2. Score 6/H: Faults may have resulted from damage to MICNS cards or electronics. 3. Without continuous BIT communication the link would be expected to drop. 4. The lack of continuous communication may have resulted from antenna misalignment due to survey error. 5. No evidence that operator made an incorrect entry.
A 25 003:863431231 Air Data Terminal Launch	AV launch abort during launch sequence. A MICNS fault came up on the teletype. Ran test 21, no faults noted. During engine runs links dropped. Block 20 data indicated bad GCS messages and ADT lockup and continuous monitor BIT.	Other possible contributing factors: Same as previous items.
A 05 004:863451439 Mission Payload Subsystem Launch	AV was timed out because of fluctuating signal strength and LED did not become visible during payload check (laser boresight LED). Found that launcher heading was given wrong; caused link problems on first two attempts but after correction still had a video problem. RAM DAG info: launcher operator gave wrong heading to GCS operator and those errors caused lost links. The first two aborts on AVOs on 3461439 were diagnosed as the launcher having the wrong truck heading. ORG mechanic had no extra payloads to try so he evacuated the AV to DS maintenance. Payload video would not boresight and would not lock on rail before launch. NOTE: Maintenance allocation chart did not reflect DS or GS maintenance requirement. The DS repairman immediately evacuated the AV to depot where it was repaired. RAM DAG info: boresight problem is an abort criteria. Fault could not be duplicated at depot. AV put back into service.	1. Other possible contributing factors: a) Score 6/U: Operator was scored due to the numerous factors that probably caused the incident. b) Other factors include: 1) Payload would not boresight. 2) Payload would not lock. 3) No replacement payloads were available. 4) Payload software indicated a fault that was not confirmed at DS. 2. Other considerations: a) Launcher operator may have given the wrong heading (score T: may be inappropriate). b) The quality of the transmission over the landline may have been too poor to be heard correctly by the operator. c) The MAC chart does not reflect DS/GS responsibility.
R 43 003:870061253 Camera Platform Sortie in Flight	Went to manual on camera platforms to recover AV.	Other considerations: 1. Not enough information was given in the description to score incident. 2. Hardware and software may have been involved in the incident. 3. May have involved a failure to zero the guidance recovery cameras. 4. May not have had an "AZ or EL go" indicated.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
G 31 008:863401158 Data Transfer Cable Site Setup	After plugging in the DAIA transfer cable and data transfer being inoperable, CW2 Kesner checked the data transfer cable and found that a wire had come loose. He then went to the motor pool to get another cable. Another cable was brought in and hooked and the deficiency was corrected. The data transfer cable was found to be defective by CW2 Kesner. Upon finding the cable defective, he removed it. He then acquired another cable and put it on, thereby closing the incident. RAM DAG investigation information provided by Lockheed representative, 13 Jan 87. Per Kesner the TTY was pulled out without disconnecting cable. Seven of nine wires were pulled out of a data cable in the GCS. Operator/maintenance error.	1. Other possible contributing factors: a) Score 6/Q: The cable was found to be defective. b) Score 6/H: The cable may be too short to allow the TTY to be moved without damaging the cables. 2. Other considerations: a) TTY cables may need to be consolidated into a common wire and single receptacle.
R 43 004:870061313 Control Box Recovery	During first recovery attempt AV altitude was noted as high. Further checking showed azimuth Go/No Go light to be lit showing BIT/BYTE determine fault. Manual adjustment of the AZ camera was performed on leveling unit. Referred to DS/GS maintenance. Followed test procedure to switch boards but TM was unclear as to which step was next so DS/GS maintenance was called in for assistance. Admin delay was started while waiting on DS/GS maintenance to reach field site. Date (7006) 2407 w/o No#0109 RPV BTRY, PS#4 elevation camera won't level. Used all troubleshooting methods up to replace A3 card. Leak around jack in control box repaired and returned to unit.	Other considerations: a) The BIT/BITE fault indication as an incident did not involve the TMs. b) Leveling meters may have a bias. At Fort Sill, operators have had to adjust the leveling unit three degrees beyond zero in order to level a true zero.
L 41 017:870121027 Launcher Launch	Operator error. Shroud of AV was in between RGT and AV. This incident was caught at a later date. Changed truck heading.	Other considerations: 1. Score 6/T: The geometry of the emplacement site becomes very important if the structure and position of the AV shroud interferes with the RGT link. TMs and training should emphasize the appropriate position and alignment of equipment. 2. The signal strength of the link or sensitivity of the link receptor may need to be increased if small structures interrupt the link.
R 43 007:870121305 Steel Brake Rope During-OPS Check	When the recovery system set up for second recovery of the day, the cables were crossed. When the crew took off the net to straighten cables they discovered that the lower outside brake rope had strands broken and kinked. The decision to erect the net was made to recover the bird due to the AV having little fuel left. Delay due to site being frozen for AV crash, movement, return to repair for temporary sensor unit repair where SP4 Gibson replaced the steel rope at 1509.	1. Other possible contributing factors: Score 6/H: Brake rope may have been damaged during previous hot recovery. 2. Other considerations: a) No evidence that operators caused the broke rope strands. b) Better routing of brake rope may be necessary.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
A 18 002:870121326 RGT Sortie in Flight	Recovery was being performed. AV18 had passed over the recovery system twice. Into the third attempt the RGT had lost main generator power and backup generator was not supplying enough power which caused a lost link with RGT to AV18. At this time AV had four minutes of fuel left. AV18 parachute was activated. AV damaged on backup recovery. Roy Gunn determined AV should go to depot. RAM DAG NOTE: React team report states wind had shifted 90 degrees forcing movement of recovery system which resulted in flight path over RGT which could cause lost link in addition to generator out of fuel.	Other considerations: a) Recovery abort could be caused by several factors. b) Generator power loss could be caused by several factors. c) Lost link was not due to operator. d) Wind shift required movement of the recovery system. The subsequent requirement to realign the RGT in certain situations should be reflected in the TMs and training.
E 46 002:870110630 30KW Generator During-OPS Check	When generator was started it ran for about 10 minutes, then it shut off. SSG Ramos started it back up and it ran for about another 10 minutes then shut off again. SP4 Roman inspected generator 46 and noticed the fuel indicator was full. He inspected the fuel tank and noticed it was low. He then suspected water in the fuel filter, drained it and started up the generator.	Other considerations: a) Evidence indicates that the operator performed the correct procedures. b) Should determine which operator is indicated (i.e., 13T, 13TP9, or 52D).
G 41 021:870230653 Video Display Units Launch	During launch attempt, the payload video would not appear on screen. This was caused by operator error. MC input wrong # code in MIM panel. Extra comment statement made by Gibson: Statement concerning confusion caused by "no video" aborts, and the 20 manuals, DEP 11-5820-913-20-1 and -3. SGT Gibson, Kent K. 534-70-4225. The organizational maintenance manual, DEP 11-5820-913-20-1, for the GCS, per procedure 2-78, troubleshoots, "no video at video monitors," by instructing the the RPV mechanic to perform task 24-3, and inspect test task for the GCS interface unit. Task 24-3 is a laborious and time-consuming task that normally takes 4-6 hours to complete. (Continued on G-6 performance perform) After two launch attempts the AV15 was removed from the rail and replaced by AV20. Remove and replace time refers to the changing of the AV. At 1148, the FCS's GCS completed an engine run up and the same faults appeared. At this time the P9 stopped troubleshooting.	Other considerations: a) Many factors may contribute to the input of incorrect codes such as noise leading to confusion, CEOI tables that are difficult to read, distractions caused by other crewmen. b) A wrong code should not have required such extensive troubleshooting procedures to be used.
G 41 002:860231100 GCS Radio No 1 RT524 Pre-OPS Check	This was not noted during the prior shift. The GCS talked to the BOC on several occasions but could not talk to anyone else. RAM incident number G41002, G41003 and G41004 be combined into one incident. Time indicated in incident G41002 is the total time for work done per scoring conference agreement. Item #8, no manuals were used. Batteries were installed in the KY57 (secure device). Did not use manuals.	Other possible contributing factors: Score 6/U: It is unknown whether obstructions or distances interfered with GCS transmissions.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
A 15 006:870240947 Operator During-OPS Check	Video freeze induced by AVO. Changing AJ modes did not allow enough time to check MPS and cage payload before engine timeout. RAM DAG info: The attempt to launch AV15 was started at 0937 and timed out at 0947. The launch sequence was restarted at 0952 resulting in a successful launch as 1002. Reconfigured and AV launched. 1. Reengaged started; 2. Rebooted GCS; 3. Reinitialized the AV; 4. Reenter launch sequence.	Other considerations: a) AVO should be written as MPO. b) In order to check the MPS and to lock (cage) the payload before engine time out, the MPO must travel to the rear of the GCS to check the MICNS panel. The MICNS panel should be located closer to the MPO console to reduce the need to travel.
R 43 012:870261326 Manometer 25 Bar Pre-OPS Check	During pre-operations checks, PFC Anthony hooked up the low pressure gauge to the high pressure side of hydraulics to check reading. When Anthony hooked up the gauge to the low pressure side the gauge would not register a reading. Maintenance delay was due to emplacing camouflage. Replaced gauge from PLL. Color coded new gauge by painting yellow on it.	Other considerations: a) The confusion created by hydraulic lines that are unlabled and similar probably cannot be compensated for by additional training. b) Possibly a type of inline reducer could be placed in the high pressure line. Used only for gauging, the reducer would require only one pressure gauge for check reading.
A 18 005:870301105 Payload Sortie in Flight	While in flight, Mr. Carter decided that the payload video was too jumpy in order to fire a Copperhead mission (In feature track). SSG Tappen P9er checked payload and determined new payload was needed. SSG Tappen and SP4 Alarie changed payloads in AV18.	Other possible contributing factors: a) Score 6/U: GS2 Carter followed appropriate procedures. b) The disturbance in the payload video may have resulted from hardware, software, or environmental factors. SSG Tappen determined a new payload was required.
L 42 019:870301135 Starter Launch	Starter did not disengage. RAM DAG NOTE: As the launcher would begin to pressurize the launch cables would tighten, moving the shuttle slightly forward, causing the microswitch to open momentarily, causing the launcher to depressurize and go to a RED status on the launch control panel. With the launcher in a RED status, the launch sequence would time out. Individual looked at starter, but did not perform any maintenance.	Other possible contributing factors: a) Score 6H: The incident describes problems related to hardware. b) Wear on the microswitch or post may have caused the switch to open.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
A 18 006:870341604 Parachute Squib Launch	While AV18 was on launcher going through launch sequence, parachute squib fired deploying parachute. RAM DAG NOTE: From performance data it was determined that AV18 was replaced with AV21 with a mission delay of 48 minutes. P9ers had to go to rear to pick up parachute squib. Bill Ward diagnosed AV and performed test 10. AV, no faults. DS/GS determined that AV must return to the rear for maintenance and change parachute squib before sending to DS. Performed test 10 which determined that AV should be returned to the rear for maintenance. The AV was referred to depot for repairs. The AV returned from depot repaired.	Other considerations: a) There is no description or evidence that operators contributed to the incident. b) A possible BIT error may have occurred.
E 07 002:870350700 Choke Valve During-OPS Check	During operations checks the voltage was erratic and jumped from 119V to 125V constantly on E-7 A 1.5 KW GEN. Upon arrival SGT Ervin inspected, started, and moved choke switch from 1/2 onto a complete OFF position.	Other considerations: a) There is no evidence that the operator did anything incorrectly. b) Operators have reported that they would benefit from more training on generator maintenance and operations.
H 44 012:870351325 Servicer Unit During-OPS Check	Cap to FSU popped off during defueling. Due to the fact while defueling, SM was going too fast which causes a lot of air pressure in FSU. No maintenance was performed, nothing was broke. Defueling too fast caused a lot of air pressure making cap of FSI pop off and spread fuel everywhere. Bypass tube for the FSU was replaced. No problems during. Envig says that replacement of the tube should keep the cap from coming off again. Tube was taken off of the unserviceable FSU.	Other considerations: a) There is no criteria or caution in the TM for defueling too rapidly. b) Under combat conditions the service pump should be operable while pumping rapidly. c) The pump cap should not pop off as a result of rapid pumping or pressure buildup. The current cap may be unsafe.
A 10 005:870351333 ADT Launch	During launch sequence had a block 20 data (ADT pointing failure). Launcher crew rechecked PMCS on AV. AV ready for second launch sequence at 1337.	Other considerations: There is no evidence that the operator did anything incorrectly.
L 42 024:870420659 Microswitch Launch	During launch sequence the rail and AV READY light went out and launcher NOT READY light came on. Successful launch at 0930. PFC Hornbeck reinitialized launched initializer.	Other considerations: There is no evidence that the operator did anything incorrectly.
L 42 032:870430756 Initializer Launch	AV aborted during launch sequence due to wrong data in initializer. PFC Hornbeck checked initializer. Then he entered correct data. Incident ends and starts at LSI.	Other considerations: a) The quality of the voice transmission of data over the landline is often poor. b) Transferring digital data electronically from the GCS to the launcher was preferred by operators.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
R 43 022:870481508 Camera, Azimuth Recovery	While AV was coming in for recovery, AV was flying erratically from side to side, then aborted recovery. Four attempts were made to recover. No BIT/BITE fault was found on "AZ camera overload." AV was recovered at FCS with backup recovery system. Lockheed suggested to exchange cameras to see if that was the problem. NOTE: Backup recovery system at the FCS is not part of the tested system. SSG Tappan could not find fault. SGT Plucker took AZ camera off and will exchange with one from the ASL.	Other considerations: There is no evidence that the operator did anything incorrectly.
R 43 023:870491643 Ballistic Shield Site Takedown	While stowing recovery barrier, the ballistic shield from the elevation RGA camera fell, missing PFC Polock by two feet. The shield was bent from fall. SGT Plucker bent shield back into shape and replaced it back on camera shroud.	Other considerations: a) There is no evidence that the operator did anything incorrectly. b) The ballistic shield design may require review in order to ensure that it can remain securely attached under all conditions (i.e., vibrations, environmental, and frequency of use).
R 43 026:870550757 Steel Rope, Deceleration Standby	After checking RGA camera, crew was stowing recovery when a deceleration steel rope caught on barrier causing steel rope, deceleration guide roller to break and bent guides for roller and cover to deceleration unit. Removed guide assembly and was going to be replaced but assembly was incorrect. Replaced roller instead. Contractor welded guides back on. Replaced #1 & 4 deceleration cables.	Other considerations: a) Deceleration guide rollers may not have sufficient durability. b) Score 6/Q: The description seemed to indicate that the roller guide had been incorrectly assembled.
J 40 010:870601900 Truck, M880 Enroute Movement	Vehicle was stuck in the ditch and was not recovered until next morning (0736). There was apparent body damage where vehicle was recovered, however, a more exclusive technical inspection will be done in the rear. Vehicle was recovered by a 2 1/2 ton and taken to the rear for a technical inspection. When vehicle ran into the ditch one headlight was broken. The part was order and is now fixed.	Other considerations: M880 may require the appropriate equipment or tools for self-recovery.
L 42 045:870620705 Launcher Launch	Before launch sequence the LO notified GCS that the RGT was not pointing at the launcher. The GCS crew asked the RGT operator who said it was. They still went into launch sequence. Didn't gain links. Launch was aborted. PVT Eddy entered new data sent by GS into the initializer.	Other possible contributing factors: 1. Additional training may be required so that crewmen can rapidly determine whether the RGT is pointed properly at the launcher. 2. The LO acted appropriately.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
M 50 012:870620823 RGT Sortie In Flight	While in flight, AV19 lost links with RGT. At 0823.38, a position error appeared on screen. AT 0823.41, video freeze. There was down link activity until 0827.57. At 0825.15, WP91 appeared on screen. At 0831.39, down link activity began. At 0832.29, WOP3 appeared on screen. At 0832.32, down link activity stopped. At 0833.22, WP91 appeared on screen. At 0833.53, down link activity began again. At 0834.03, WP03 appeared on screen. At 0835.36, down link activity stopped. At 0836.26, WP91 appeared on screen. At 0839.14, down link activity began. At 0840.46, down link activity stopped. At 0840.50, Anderson Mountain popped the chute. A large tree which was in the line of contract between RGT/AV caused lost links. At 1004, G. Matthews conducted all self-test on RGT, they checked out negative and were completed at 1014. He then did a link check which also proved to be negative at 1025-1031. He then concluded that RGT was good to go.	Other considerations: a) Incident M50 012 may have been related to the previous item, incident L 42 045. b) Operators may need improved emplacement geometry and obstructions.
G 41 046:870651125 GCS Launch	During launch sequence links could not be established. The AVO (SGT Duncan) checked the initializer data with the LO. He then reentered the data and the azimuth of the ADT was changed by 20 mils by changing the truck heading 20 mils.	Other considerations: The ADT may have caused the 20 MIL error. There may have been situations where the launcher heading was correct, yet an ADT pointing error occurred.
G 41 083:870711600 GCS Launch	OK to launch. Light never came on. GCS personnel input wrong number. Re-input numbers.	Other considerations: a) If the operator had put an incorrect number into the MIM panel, the error should have been detected earlier. Other reasons for no OK to launch light to appear include failure to pressurize, payload lock, etc. b) There is no evidence that operators made an error. c) There is no easy way to verify correct numbers.
R 43 035:870721222 Truck Heading Recovery	During recovery approach AV did not line up on flight path, causing two aborted recoveries. The heading was rechecked, which was the same as they gave the first time. Upon checking the videotapes it was noted that the correct heading was given to the AVO, but he heard it wrong and read it back to him wrong. They were in MOPP IV at the time, causing some of the hearing problem. Edited truck heading through TTY into computer. Next attempt was successful.	Other considerations: Operators have reported that the quality of transmission on the landline was poor.

Table 6.1. RPV MANPRINT Review of RAM Incidents Charged to Operator or Technical Manuals (cont'd)

Incident No.: Date/Time Subsystem/Component Activity Conducted	Description of Incidents	MANPRINT Review
E 09 004:870761355 Generator E09 Sortie in Flight	Because the fuel valve was set on SET TANK instead of AUXILIARY TANK, the generator ran out of fuel, causing a "lost-links" condition. Once this was corrected, power was restored and RGT safety reset restored commo to AV. The only maintenance performed was evaluation of the problem - out of fuel - and the correction of the line valve to allow fuel to flow from the auxiliary fuel tank to the generator.	Other considerations: Operators have requested more training of generator operation and maintenance.
E 46 006:870781155 Generator Sortie in Flight	While putting oil in generator 46G, the oil can slipped from SSG Ramos' hand and broke the oil pressure safety switch. SSG Starks removed oil pressure safety switch and borrowed a soldering gun from the BDM representative. He soldered the switch together, put in back on the generator, then checked out the generator to ensure that it would work.	Other considerations: Operators have requested more training of generator operation and maintenance.
R 43 035:870721232 Truck Heading Recovery	During recovery approach, AV did not line up on flight path causing two aborted recoveries. The heading was rechecked, which was the same as they gave the first time. Upon checking the videotapes, it was noted that the correct heading was given to the AVO, but he heard it wrong and read it back to him wrong. They were in MOPP IV at the time, causing some of the hearing problem. Effect on mission: aborted. Primary mission essential functions affected: launch, flight, commo, not affected; recovery, lost; movement, not affected. Edited truck heading through TTY into computer. Next attempt was successful.	Other considerations: a) Noise levels in the GCS when the radios operate make voice communications difficult. b) The MOPP mask affects the operator's ability to hear. c) The quality of the transmission over the landline is poor.
G 42 070:870710805 GCS Channel Code Launch	AV-GCS could not establish links because of wrong channel code. Channel code defaulted when generator went down at RGT and switched to backup. Effect on mission: delay. The right channel code was put in at GCS. This, however, did not solve link problem because they did not achieve links with AV10. Two incidents with AV10 - A10018, A10019. AV was replaced.	Other considerations: a) 6/S software: The incident may have resulted from the RGT defaulting to the wrong code. b) If the incident was only attributable to a wrong channel code, when the code was reentered, everything should have worked as desired.
R 43 036:870721909 RGA Camera RGA Recovery	Wire to terminal for RGA kicked out of post by soldier. Effect on mission: aborted. Put wire back onto terminal.	Operators may have failed to place a service loop in the WD1 landline. Training should emphasize this.

Table 6.2. RPV Maintainers Interview

1. (3.5.15) Were personnel able to effectively perform maintenance functions in MOPP 2 gear?

   Yes = 3 No = 1 N.A. = 0

2. (3.5.15) Were personnel able to effectively perform maintenance functions in MOPP 4 gear?

   Yes = 3 No = 1 N.A. = 0

3. (3.4.72) Were adequate alternative diagnostic procedures available when BITE/TMDE was not?

   Yes = 0 No = 3 N.A. = 1

4. (3.4.73) Were the maintenance authorizations and organization adequate?

   Yes = 1 No = 3 N.A. = 0

5. (3.4.74) Is the MAC effective in its present form?

   Yes = 1 No = 2 N.A. = 1

6. (3.4.81) Overall, is the logistics support concept for RPV adequate?

   Yes = 1 No = 2 N.A. = 1

7. (3.4.82) Is the System Support Package adequate as tested?

   Yes = 1 No = 0 N.A. = 3

8. (3.4.84) Are POL and maintenance recovery capabilities adequate for mission performance?

   Yes = 2 No = 1 N.A. = 1

9. (3.4.84) Is the battery able to coordinate and obtain all needed classes of supply for widely separated RPV sections during field deployment?

   Yes = 1 No = 2 N.A. = 1

10. (3.4.87) Is the current assignment strategy of supply and maintenance personnel adequate for effective mission performance?

    Yes = 2 No = 2 N.A. = 0

11. Are common and special tools supplied with RPV equipment adequate for effective mission performance?

Yes = 2 No = 2 N.A. = 0

12. Is TMDE and Calibration equipment for RPV adequate?

Yes = 2 No = 1 N.A. = 1

13. (3.4.75 & 3.4.88) Do the TMs have adequate logistics support procedures documentation?

Yes = 1 No = 1 N.A. = 2

14. (3.4.80) Overall, are RPV parts easy to remove, repair and replace?

Yes = 4 No = 0 N.A. = 0

15. (3.4.84) In the proposed RPV system, are all classes of supply available at the proper echelons?

Yes = 1 No = 1 N.A. = 2

16. Were the training aids used during RPV training adequate?

Yes = 1 No = 3 N.A. = 0

17. Were the training devices used during RPV training adequate?

Yes = 1 No = 3 N.A. = 0

18. In your opinion, are there any items of environment, such as illumination, noise, ventilation, temperature, vibration, and climate that pose a potential problem for RPV operators?

Yes = 3 No = 0 N.A. = 1

19. Is the information in the RPV Technical Manuals presented clearly?

Yes = 0 No = 4 N.A. = 0

20. Is it easy to look up or locate information related to a specific problem in the technical manual (TM)?

Yes = 1 No = 3 N.A. = 0

21. Is the TM sufficiently small and rugged that it can be carried and stowed under operational conditions with a minimum of difficulty or damage (lost pages, etc.)?

Yes = 0 No = 4 N.A. = 0

22. Are there any other problems you've encountered with the TM? Your recommended solutions and improvements would be appreciated.

Yes = 2 No = 1 N.A. = 1

23. Do you feel there should be more classroom training?

Yes = 3 No = 1 N.A. = 0

24. Do you feel there should be more collective (unit) training?

Yes = 1 No = 3 N.A. = 0

25. (3.4.91) Have you observed any other training problems which you feel are important?

Yes = 1 No = 0 N.A. = 3

26. Were the Skill Performance Aids adequate in assisting successful task performance?

Yes = 0 No = 1 N.A. = 3

27. (3.4.92) In your opinion, can 90% of the soldiers perform 90% of the RPV related SQT tasks?

Yes = 3 No = 1 N.A. = 0

28. (2.9.4.5) Have you or others identified critical tasks that were not included in training?

Yes = 2 No = 0 N.A. = 2

Have you had any problems efficiently using the following components of the Maintenance Shelter?

29. Boom and Hand Winch

Yes = 3 No = 1 N.A. = 0

30. ADT Installation fixture

Yes = 1 No = 3 N.A. = 0

31. MPS Lifting Fixture

Yes = 1 No = 3 N.A. = 0

32. Air Vehicle Workstand

Yes = 2 No = 2 N.A. = 0

33. AV Wing Storage Rack

Yes = 3 No = 1 N.A. = 0

Have you had any problems using the:

34. AV Sling

Yes = 1 No = 3 N.A. = 0

35. AV Recovery Harness

Yes = 0 No = 4 N.A. = 0

36. AV Hoisting Fixture

Yes = 0 No = 4 N.A. = 0

37. AV Support Stands

Yes = 1 No = 3 N.A. = 0

Have you experienced any problems with removal, repair, or replacement of the following RPV components?

GROUND CONTROL SHELTER

38. Communication Panels

Yes = 1 No = 3 N.A. = 0

39. Video Monitors

Yes = 1 No = 3 N.A. = 0

40. Mission Payload Control/Display Panel

Yes = 1 No = 3 N.A. = 0

41. Ground Data Terminal Control/Display

Yes = 1 No = 3 N.A. = 0

42. Air Vehicle Control/Display Panel

Yes = 1 No = 3 N.A. = 0

43. Master Interface Module

Yes = 1 No = 3 N.A. = 0

44. GCS Computer

Yes = 1 No = 3 N.A. = 0

45. Mission Planning Unit

Yes = 1 No = 3 N.A. = 0

46. Navigation Display Unit

Yes = 2 No = 2 N.A. = 0

AIR VEHICLE MOBILE CRANE

47. AV Hoist

Yes = 2 No = 1 N.A. = 1

48. AV Fuel Service Unit

Yes = 2 No = 2 N.A. = 0

49. Remote Controller

Yes = 2 No = 1 N.A. = 1

RECOVERY VEHICLE

50. Recovery Net

Yes = 1 No = 2 N.A. = 1

51. Barrier Support Structure

Yes = 1 No = 2 N.A. = 1

52. Support Structure Control Assembly

Yes = 1 No = 2 N.A. = 1

53. Power Distribution Panel

Yes = 1 No = 2 N.A. = 1

54. Signal Processing Panel

Yes = 1 No = 2 N.A. = 1

55. Guidance Cameras

Yes = 1 No = 2 N.A. = 1

LAUNCH VEHICLE

56. AV Starter

Yes = 1 No = 2 N.A. = 1

57. Shuttle

Yes = 1 No = 2 N.A. = 1

58. Guide Rail

Yes = 1 No = 2 N.A. = 1

59. AV Loader

Yes = 3 No = 1 N.A. = 0

60. Launch Control Panel

Yes = 1 No = 2 N.A. = 1

61. Launch Command Panel

Yes = 2 No = 1 N.A. = 1

62. MICNS Initialization Module

Yes = 1 No = 2 N.A. = 1

REMOTE GROUND TERMINAL

63. Remote Control Unit

Yes = 1 No = 2 N.A. = 1

64. Electrical Panels

Yes = 1 No = 2 N.A. = 1

65. Antenna

Yes = 1 No = 2 N.A. = 1

AIR VEHICLE

66. Mission Payload Subsystem

Yes = 1 No = 2 N.A. = 1

67. Laser Rangefinder

Yes = 1 No = 1 N.A. = 2

68. Optics

Yes = 1 No = 2 N.A. = 1

69. Autotracker

Yes = 1 No = 1 N.A. = 2

70. Propulsion System

Yes = 1 No = 2 N.A. = 1

71. Electrical System

Yes = 1 No = 2 N.A. = 1

72. Flight Control System

Yes = 1 No = 2 N.A. = 1

73. Near-Infrared Strobe Flasher

Yes = 1 No = 2 N.A. = 1

74. Parachute Assembly

Yes = 1 No = 2 N.A. = 1

75. Are the diagnostic outputs of the RPV equipment easy to use?

Yes = 3 No = 1 N.A. = 0

76. In your opinion, is the RPV BITE effective for system maintenance?

Yes = 1 No = 2 N.A. = 1

77. In your opinion, would the RPV be effective (if fielded in its present form) for aiding Division Field Artillery missions?

Yes = 3 No = 0 N.A. = 1

78. Have you had any difficulty understanding the RPV maintenance problems?

Yes = 3 No = 1 N.A. = 0

79. Is the overall operation of the RPV equipment effective?

Yes = 3 No = 0 N.A. = 1

80. In your opinion, is the AVFI set effective in its support of field maintenances' mission?

Yes = 1 No = 2 N.A. = 1

81. Have you observed any physical interface problems with RPV?

Yes = 2 No = 1 N.A. = 1

82. In your opinion, does RPV have "operational utility" (is it useful and do we need it)?

Yes = 4 No = 0 N.A. = 0

83. Are all AVFI problem codes easy to read and understand?

Yes = 4 No = 0 N.A. = 0

84. Are adequate prompts (instructions or cues) displayed by the AVFI when operator action is required?

Yes = 4 No = 0 N.A. = 0

85. Are RPV maintenance procedures easy?

Yes = 4 No = 0 N.A. = 0

86. Are maintenance procedures confusing or difficult in any ways not already described? Please discuss.

Yes = 2 No = 2 N.A. = 0

87. Are the maintenance procedures easy to follow and understand?

Yes = 2 No = 2 N.A. = 0

88. Do you feel the amount of training given was adequate considering the backgrounds and skill levels of the students?

Yes = 1 No = 3 N.A. = 0

89. In your opinion, does the AVFI set support the maintenance mission in a satisfactory manner?

Yes = 2 No = 2 N.A. = 0

90. Have you ever noticed any of the codes and/or procedures used in the maintenance/repair of RPV that are confusing or need to be changed?

Yes = 2 No = 2 N.A. = 0

91. Are there any maintenance procedures which are not in a logical order?

Yes = 4 No = 0 N.A. = 0

SAFETY

Have you or others observed potential or actual safety hazards that could result in shock, burns, falls, cuts, bruises, explosions, entanglements in moving parts, strains due to lifting or handling, or other injuries? Please consider all situations when the equipment will be operated: at night; with MOPP gear; in rain or snow; in heat, etc. Also consider all aspects of the equipments' operation: movement from sit to site; site setup; preparation for mission; actual mission operation, and site break-down.

Please answer for each equipment component.

GCS

92. Air Vehicle Console

Yes = 1 No = 2 N.A. = 1

93. Mission Payload Console

Yes = 1 No = 2 N.A. = 1

94. Mission Commander Console

Yes = 1 No = 2 N.A. = 1

95. Mission Planning Facility

Yes = 1 No = 2 N.A. = 1

96. Computer Suite

Yes = 1 No = 2 N.A. = 1

97. Communications Panels

Yes = 1 No = 2 N.A. = 1

98. Modular Collective Protection Equipment

Yes = 2 No = 1 N.A. = 1

99. Power Supply Panels

Yes = 2 No = 1 N.A. = 1

100. Ground Support Equipment

Yes = 2 No = 1 N.A. = 1

MAINTENANCE SHELTER

101. Power Panels

Yes = 1 No = 2 N.A. = 1

102. AV Wing Storage Rack

Yes = 1 No = 2 N.A. = 1

Comments: Possible damage to wings.

103. MS Hoist Assembly

Yes = 2 No = 1 N.A. = 1

Comments: Possible cable breaks.

104. Air Vehicle Fault Isolater

Yes = 0 No = 3 N.A. = 1

105. Internal Power Board

Yes = 1 No = 2 N.A. = 1

106. Work Bench

Yes = 0 No = 3 N.A. = 1

107. Tools

Yes = 0 No = 3 N.A. = 1

108. Storage

Yes = 2 No = 1 N.A. = 1

Comments: Possible cable breaks.

109 AV Workstand

Yes = 0 No = 3 N.A. = 1

110. Ground Support Equipment

Yes = 1 No = 2 N.A. = 1

111. Universal Support Stand

Yes = 1 No = 2 N.A. = 1

Comments: The track of lights down the middle of the shelter needs to be recessed or moved or limit ASI DA to those 5'5" or shorter.

AIR VEHICLE MOBILE CRANE

112. AV Container

Yes = 3 No = 1 N.A. = 0

113. AV Fuel Servicing Unit

Yes = 3 No = 0 N.A. = 1

Comments: Constant leakage.

114. Boarding Ladders

Yes = 3 No = 0 N.A. = 1

115. AV Crane

Yes = 3 No = 0 N.A. = 1

116. AV Recovery Harness

Yes = 1 No = 2 N.A. = 1

117. AV Hoisting Fixture

Yes = 2 No = 1 N.A. = 1

Comments: Containers are oversized and clumsy.

LAUNCHER

118. AV Starter

Yes = 3 No = 0 N.A. = 1

119. Shuttle

Yes = 3 No = 0 N.A. = 1

120. Guide Rail Assembly

Yes = 3 No = 0 N.A. = 1

121. AV Loader

Yes = 3 No = 0 N.A. = 1

122. Railfold Actuator

Yes = 3 No = 0 N.A. = 1

123. Power Panels

Yes = 3 No = 0 N.A. = 1

124. Hydraulic System

Yes = 3 No = 0 N.A. = 1

RECOVERY VEHICLE

125. Recovery Net

Yes = 1 No = 2 N.A. = 1

126. Net Support Structure

Yes = 2 No = 1 N.A. = 1

127. Decelerator

Yes = 1 No = 2 N.A. = 1

128. Operator Stand

Yes = 2 No = 1 N.A. = 1

129. Power Distribution

Yes = 1 No = 2 N.A. = 1

AIR VEHICLE

130. Engine

Yes = 2 No = 1 N.A. = 1

131. Fuel System

Yes = 2 No = 1 N.A. = 1

132. Electrical System

Yes = 1 No = 2 N.A. = 1

133. Mission Payload

Yes = 1 No = 2 N.A. = 1

REMOTE GROUND TERMINAL

134. Antenna

Yes = 2 No = 1 N.A. = 1

135. Batteries

Yes = 2 No = 1 N.A. = 1

136. Power Panels

Yes = 2 No = 1 N.A. = 1

137. Control Panels

Yes = 1 No = 2 N.A. = 1

138. Power Generator

Yes = 3 No = 0 N.A. = 1

139. Have you or others received any injuries during the conduct of this test while operating or maintaining RPV equipment? Please describe what you were working on and what caused the injury.

Yes = 1 No = 2 N.A. = 1

Comments: I haven't, others have. Irritated the scar tissue around my hernia. I don't remember what I was working on — too many possibilities to isolate.

7.0 TEST PARTICIPANTS' COMMENTS AND OPINIONS

7.1 The comments and opinions of test participants were collected throughout the test. The comments and opinions were sorted for reporting purposes, first by critical tasks and second by MANPRINT areas of concern applicable to the critical tasks. Table 7.1.1 lists the code taxonomy used to sort the comments and opinions. Table 7.1.2 lists the actual comments and opinions. The heading "line of comment" indicates how many lines were of one comment.

7.2 The comment and opinion data base was developed to supplement the findings of the critical task assessment and structured interviews. Crewmen often find it easier to respond during informal discussions conducted in the field than during more formal structured interview sessions.

Table 7.1.1. The Code Taxonomy Used for Sorting Comments and Opinions

CRITICAL TASKS

A. GCS Emplacement (CTA0012)
B. Launch Subsystem Emplacement (CTA0009)
C. Recovery Subsystem Emplacement (CTA0011)
D. RGT Emplacement (CTA0010)
E. Install/Stow FO Cables (CTA0083)
F. Measure Hor/Vert Using RGT (CTA0004)
G. Power-Up GCS (CTA0074)
H. Prepare Recovery Subsystem (CTA0096)
I. Deploy Recovery Barrier Support (CTA0096)
J. AV from Container to Support Stand (CTA0102)
K. AV from Stand to Launch Subsystem (CTA0100)
L. Prelaunch Operations (CTA0025)
M. Enter & Verify AV Mission (CTA0031)
N. Launch AV (CTA0040)
O. Perform Handoff (CTA0037)
P. Position AV on Gun Target Line (CTA0055)
Q. Operate Payload in Track Mode for Copperhead (CTA0054)
R. Arty Adjust Communications (conventional munitions) (CTA0051)
S. Damage Assessment (CTA0052)
T. Lost Link Reacquisition (CTA0039)
U. Perform AV Recovery as AV Operator (CTA0049)
V. Remove Recovery Net (CTA0066)
W. Stow Recovery Subsystem (CTA0067)
X. Defuel AV (CTA0027)
Y. Perform Emergency Hydraulic Slave (CTA0101)

0. Not Applicable
1. Target Identification
2. Artillery Mission
3. Other

MANPRINT AREAS OF CONCERN

A. Target Acquisition
B. Training & Training Aids
C. Safety & Health Hazards
D. Manpower & Personnel
E. Crewstation Design
F. Communications
G. Controls & Displays
H. Anthropometrics & Biomechanics
I. Environment
J. PMCS
K. Test Equipment/BITE
L. Tool Supply
M. Parts/Supply
N. Maintenance Levels
O. Maintenance Manuals
P. Operating Manuals
Q. Maintenance Procedures
R. Operating Procedures
S. Equipment Design
T. MOPP-NBC
U. Stowage

0. Not Applicable
9. Other

Table 7.1.2. Comments and Opinions of Test Participants

MANPRINT*PRIMARY=N.A.

Line of Comment	COMMENT
1	THE GUY THAT SHOULD WORK THE HARDEST IS THE BATTERY COMMANDER. SHOULD
2	KNOW EVERYTHING THAT THE BATTERY IS DOING AND INTERFACE WITH ALL THE V
3	ARIOUS COMMAND LEVELS. SUGGENSTION: GIVE HIM AN M113, THREE NETS, DR
4	IVER, AN RTO, HIMSELF, A 91 OR 96, TRAINED FO OR SOMETHIN ELSE. COULD
5	SIT THERE AND INTERPRET WHAT'S GOING ON. HE THEN WOULD BE ABLE TO PRO
6	VIDE US THE KIND OF INFORMATION WE NEED. IN THIS TEST THE MISSION CO
7	MMANDERS WERE THE HARDEST WORKERS IN THE BATTERY. A TECHNICIAN IS NOT

GCS emplacement MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	TACTICAL OPERATION: DURING OT II TEST ALL LAUNCH AND RECOVERIES WERE
2	DONE IN THE OPEN, CREWS DID NOT USE EXISTING COVER AND CAMOUFLAGE. ALT
3	HOUGH THE GLRS IS NOT A FRONT LINE ITEM OF EQUIPMENT, COVER, CAMOUFLAG
4	E AND LIGHT DISCIPLINE MUST BE PRACTICED BY, ALL, ALL THE TIME.
1	TACTICAL OPEATION: DURING OT II BATTERY COMMAND EMPHASIS WAS ALWAYS P
2	LACED ON CAMO OF THE EQUIPMENT, AS A RESULT NO OPERATING SECTION, GCS,
3	GENERATOR, LAUNCHER, RECOVERY TOOK ADVANTAGE OF MATURAL COVER AND CAM
4	O. KNOWING THE AVERAGE WIND DIRECTION AND WIND SPEED AND THE TERRIAN
5	LAY OUT NUMEROUS LAUNCHES AND RECOVERIES COULD HAVE BEEN MADE FROM JUS
6	T INSIDE THE WOODLINE.

GCS emplacement MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	LADDER AT THE REAR OF THE FCS PLATFORM HAS A PROTECTOR ON EACH END TO
2	PREVENT HANGING BRACKERS FROM DAMAGE. SOLDIERS OCCASSIONALLY WILL HAN
3	G THE LADDER BY THESE PROTECTORS RATHER THAN THER BRACKETS. THIS CAU
4	SES THE TOP OF THE LADDER TO BE ABOUT 3 INCHES ABOVE THE PLATFORM. TH
5	SI HAD CAUSED TRIPPING, BUT NO KNOW INJURIES HAVE RESULTED.
1	WIRE WAS THE ONLY WAY THE TOC COULD COMMUNICATE WITH THE FCS. NEED WI
2	RE AND MANPOWER TO LAY THE LANDLINE.

GCS emplacement MANPRINT*PRIMARY=COMM

Line of Comment COMMENT

1 DOCTRINE SAYS THAT YOU CAN HAVE THE BRIGADE TOC SEPARATED BY SEVERAL K
2 ILOMETERS FROM THE FCS. A POSSIBLE PROBLEM IS KEEPING A WIRE OR CABLE
3 LINE THIS DISTANCE; IT IS NO EASY TASK. FCS CANNOT DEFEND ITSELF. S
4 CHOOL AND MAXIMUM DISTANCE SHOULD BE 750 METERS (DOCTRINE).

GCS emplacement MANPRINT*PRIMARY=OPER MANUALS

Line of Comment COMMENT

1 TM DEP. 55-1550-200-10-3, TASK 2-42 ACTIVATE AND CHECKOUT 30-KW GENERA
2 TORS. THAT INFORMATION IS CONTAINED IN THE BASIC GENERATOR TM AND SHO
3 ULD NOT BE PRINTED ELSEWHERE. IF THE BASIC MANUAL IS INCORRECT THEM R
4 ECOMMENDED CHANGE TO PUBLICAITONS CHANNELS SHOULD BE OPENED. A BASIC
5 TECH MANUAL SHOULD NEVER REFER TO A MANUAL OF LESSER AUTHORITY SUCH AS
6 ABBREVIATED PROCEDURES CONTAINED IN DEP. 55-1550-200-CL-1 (THIS TASK)
7 REMOVING TASK 2-42 REDUCES THE # OF PGS FOR OPERATOR TO LEAD THROUGH.

GCS emplacement MANPRINT*PRIMARY=OPER PROC

Line of Comment COMMENT

1 MADE ERRORS OF OVER 2 METERS PARKING GCS. WITHOUT MULTIMETER COULDN'T
2 POWER-UP GCS. FORGOT TO GROUND GCS-MIGHT CROSS CABLES AND HOOK PRIMAR
3 Y GEN TO SECONDARY JACK. FORGOT TO OPEN GEN BLOWER DOORS ON 30KW. DI
4 DN'T GET WHIP ANTENNAS PROPERLY INSTALLED. VOLTAGE/FREQ. OF POWER FRO
5 M 30 KW HAS TO BE CORRECT
1 BE SURE MAIN GCS POWER BOX IS OFF CIRCUIT BREAKERS OFF.
1 MAKE SURE POWER CABLES CAN REACH THE GCS. GCS GROUND MUST BE CORRECT
2 FOR OPERATION AND SAFETY. GENERATORS MUST BE LEVEL. PUT UP CAMO NETS
3 BEFORE INSTALLING GCS ANTENNAS. CHECK OIL IN 30 KW'S. FOLLOW GCS ACT
4 IVATION/CHECKOUT CHECKLIST. NEED TASK PRACTICE TO STAY PROFICIENT.
1 GCS DOESN'T HAVE TO BE LEVEL-EXCEPT FOR COMFORT. GCS MUST BE GROUNDED
2 ; KEEP GENERATORS AS FAR AWAY AS CABLES PERMIT. STRESS GCS GROUNDING,
3 VOLTAGE AND FREQ. CHECKS IN GCS SETUP TRAINING.
1 MAKE SURE POWER-UP IS DONE ACCORDING TO PROPER SEQ.-USE CHECKLIST. TR
2 AINING: EFFECTS OF CAMO NETS ON ANTENNAS STRESS ACTIVATION SEQ. IMPORT
3 ANCE.
1 GCS-DOES NOT HAVE TO BE LEVEL. MUST GROUND GCS LEAVE A/C HOOKED UP.
1 FIBER OPTIC CABLE: ENDS SOMETIMES DON'T SEAT. ANIMALS EAT CABLE-PULL
2 IN AT NIGHT. CABLE REEL IS 2-MAN LIFT. BURY CABLE OR PUT A GUARD ON
3 IT.
1 THE ANTENNA WIRES BELOW THE GCS ANTENNA MUST BE DETACHED BEFORE A MOVE
2 . WE WOULD LIKE TO NOT HAVE TO DETACH THE WIRES.
1 IF FCS IS LOCATED ANY DISTANCE FROM THE TOC IT CANNOT BE DEFENDED. TH

GCS emplacement   MANPRINT≑PRIMARY=OPER PROC

Line of Comment	COMMENT
2	E CLOSER, THE BETTER SURVIVABILITY. MI BN TOC SETS UP RIGHT NEXT TO TH
3	E BRIGADE TOC. HAS THE HQTS COMPANY AREA. CAN BE LOCATED ELSEWHERE W
4	ITH ANOTHER UNIT THAT PROVIDES THEIR SECURITY.

GCS emplacement   MANPRINT≑PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	EQUIPMENT: THE POWER ENTRY PANEL ONT HE GCS SHOULD BE MOVED TO THE RE
2	AR OF THE SHELTER ON THE OPPOSITE SIDE OF THE ELEPJONE ENTRY PANEL. T
3	HIS WOULD ALLOW SOLDIERS TO USE THE LADDER & TAILGATE IN ORDER TO MAKE
4	POWER IMPUT CONNECTIONS RATEHR THAN STEPPING ON THE FUEL TANK. THE M
5	AIN POWER CIRICUIT BREAKER BOX COULD THEN BE PLACED AT THE REAR OF THE
6	SHELTER WHERE IT CAN BE REACAHED BY MAKING ONE STEP INSIDE THE SHELTE
7	R.

LV emplacement   MANPRINT≑PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	DON'T SEE THE IMPORTANCE OF GROUNDING THE LAUNCHER -DON'T KNOW. ALSO
2	1687.
1	SOMETIMES THE M2 COMPASS NEEDLE STICKS. SOMETIMES TROOPS TRY TO USE T
2	HE COMPASS TOO CLOSE TO STEEL OBJECTS (LIKE A TRUCK)

LV emplacement   MANPRINT≑PRIMARY=MAINT PROC

Line of Comment	COMMENT
1	LAUNCH PREP. LV - PREFLIGHT PROCEDURE DID NOT DETECT BUBBLE IN
2	PROPELLER COATINE. BUBBLE POPPED AND WAS DETECTED ON LAUNCH RAIL.
3	LAUNCH CREW FULLY OCCUPIED WITH RECURRING PROBLEMS OF FUELING AND DE-
4	FUELING. CHECK OUT PROCURES NOT CONSISTENT.

LV emplacement MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	THE LV COULD LAUNCH OUT OF ITS HIDE SITE INSTEAD OF TRAVELING OUT INTO
2	THE OPEN.

LV emplacement MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	THE LV NEEDS ITS OWN COM WIRE REEL IF IT IS TO DEPLOY UP TO 1000 METER
2	S. THE ALRGE REEL COULD BE MOUNTED INSIDE THE FORWARD BOOM BRACE (REE
3	L RL59).

RV emplacement MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
1	DEP. 55-1550-200- SERIES: THESE MANUALS DO NOT SPECIFY THE DISTANCE F
2	ROM METAL OBJECTS THAT THE OPERATOR SHOULD STAND WHEN USING THE M2 COM
3	PASS. THESE MANUALS DO NOT MENTION THE TIMES WHEN A DECLINATED VS UND
4	ECLINATED COMPASS SHOULD BE USED. RECOMMEND THAT THE BASIC MANUAL (M2
5	COMPASS) BE REFERENCED NOT REPRINTED.

RV emplacement MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	DEP 55-1550-200 SERIES: INDICATES THAT THE RECOVERY 28 VDC SLAVE CONN
2	ECTOR IS TO BE REMOVED DURING MARCH ORDER. THE OT II PLAYERS REMOVED
3	THIS CABLE ONLY IF THE TRUCK WAS TO BE JUMP STARTED. RECOMMEND THAT T
4	HIS PRACTICE BE CONTINUED SINCE IT WILL DECREASE SYSTEM SET UP TIME.
5	I DO RECOMMEND THAT A FLUSH-FIT CABLE BE USED INSTEAD OF THE CURRENT O
6	NE. A FLUSH FIT CABLE REDUCES THE POSSIBLITY OF HANG-UPS WHILE IN BUS
7	HES.

RGT emplacement MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	ALL RGT SETUP TASKS-ALIGNMENT, POSITION, VOLTAGE CHECKING,PUTTING COVE
2	RS ON FO TERMINAL BOXES; SCOPE, OPENING/CLOSING VENTS. RCV-SHOULD BE
3	COVERED IN TRAINING.
1	NEED MORE TRAINING ON 1.5 KW GENERATOR AND SURVEY TECHNIQUES.
1	PADS-BATTERY (RPV) HAS TO HAVE ITS OWN ORGANIC PADS SYSTEM AND IT PROB
2	ABLY WILL BE MORE THAN ONE. RPV BATTERY REQUIRES MORE SURVEY SUPPORT T
3	HAN A FIRING BATTERY. RPV WILL HAVE TO COME WITH ITS OWN SURVEY CAPAB
4	ILITY (SELF-SUFFICIENT). NEED MORE SURVEY POINTS, ESPECIALLY FOR CLRS
5	THAN A FIRING BATTERY.

RGT emplacement MANPRINT*PRIMARY=COMM

Line of Comment	COMMENT
1	TWO DIFFERENT CABLES; ONE TO RGT SHOULD BE 750 METERS OR LESS. REMOTE
2	VIDEO IS THE OTHER CABLE.

RGT emplacement MANPRINT*PRIMARY=PARTS SUPPLY

Line of Comment	COMMENT
1	TARPS WEAR OUT (RGT) AND ARE A SPECIAL SIZE-REPLACEMENTS ARE HARD TO
2	GET THRU THE SUPPLY SYSTEM.

RGT emplacement MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
1	TM DEP 55-1550-200-10-3 TASK 2-23 CONTAINS INFORMATION THAT IS
2	CONTAINED IN THE 1/4 TON TRAILER MANUAL. IT ALSO CONTAINS INFORMATION
3	ABOUT THE REELING MACHINE THAT IS CONTAINED IN THE REELING MACHINE
4	BASIC MANUAL. RECOMMEND THAT THE APPROPRIATE MANUALS BE REFERENCED NOT
5	REPRINTED.

RGT emplacement MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	GET STAKE UNDER RGT-BUT WE DON'T WORRY TOO MUCH. NOW TRY TO ALIGN BY
2	RED ARROWS (TELESCOPE?)
1	FORGOT MULTIMETER FOR GENERATORS - THOSE ON GENERATORS ARE NOT ACCURAT
2	E.
1	DETACH RGT FROM TRUCK-ONE OR TWO LEFT-ANOTHER PUTS LEG DOWN. ALWAYS
2	SET BRAKES RIGHT AFTER LEG DOWN.
1	EMPLACE FIBER OPTIC CABLES. GOT 2B CABLES TAKE BOTH TO GCS-TAKES EXTR
2	A TIME.
1	POWERING-UP RGT BE CAREFUL NOT TO SHORT OUT ANYTHING. ALIGNING RGT IS
2	HARD TO DO AT NIGHT.
1	RGT NEEDS COMMO-SOMEONE MESSED UP HOOKING RGT UP AT GCS-ONE WAS IN RIG
2	HT PLACE, ANOTHER IN WRONG, SO WE HAD NO COMMO.
1	RGT EMPLACEMENT; 10 METER ERROR AS 8 DIGIT COORDINATES.
1	DRIVING TO SITES-PROBLEM PICKING BEST ROUTES.
1	IF VEHICLE LEAVES RGT SITE, TAKES TIME TO GET IT BACK. DO FIBER OPTIC
2	S BY HAND TO NOT TIE UP TRUCK.
1	PUT RGT LEGS DOWN BY HAND - 3 PERSONS. (BOOK SAYS 4-PERSON TASK). WE D
2	ON'T USUALLY USE GROUND RODS-FASTER FOR DISPLACEMENT. IF CABLES ARE L
3	AID BEFORE DIGGING FOR GROUND RODS YOU MIGHT HIT CABLES WHILE DIGGING.
1	WE HAVE TROUBLE LOSING FIBER OPTIC CABLE CAPS. MIGHT CORRODE CONNECTI
2	ONS WITHOUT THE CAPS. W1033 CABLE GETS WEAK AT BOX-EMPLACEMENT IS
3	BETTER IS GCS RUNS TO THE RGT. W1033 CABLE COATING FRAYS AND HAS TO B
4	E TAPED-YOU CAN'T JUST GRAB THE BOX AND GO.
1	YOU CAN CONNECT RGT POWER CABLES WRONG AND BOTH MUST BE GUARDED.
1	RGT SURVEY-COULD GIVE BAD AZIMUTH, BAD READING, ANGLE, OPERATOR ERROR.
2	COULD BE INSTALLED IMPROPERLY. ALSO NEED COMMO WITH GCS.
1	VOLTAGES HAVE TO BE CHECKED ON RGT WITH MULTIMETER-DAMAGE COULD OCCUR
2	IF FREQUENCY AND POWER ARE WRONG. CRITICAL TO HAVE MULTIMETER. SETU
3	P TIME DEPENDS ON WEATHER TERRAIN. AVERAGE 30 MINUTES FOR WARMUP.
1	DETACHING RGT SHOULD BE 3 MAN LIFT. UNLOADING RGT EQUIPMENT DONE WITH
2	880 SO GOT TO BE SURE EVERYTHING IS OUT. SHOULD HAVE A COMMAND VEHICL
3	E FOR OTHER PURPOSES.
1	ROCKS CAUSE GROUNDING PROBLEMS; CAN'T KINK THE FIBER OPTIC CABLES; MUS
2	T LAY CABLES CAREFULLY AND KEEP VEHICLES OFF THEM. YOU MIGHT ACCIDENT
3	ALLY CONNECT A TO B. THIS WOULD SHOW UP AS A FAULT. COMMENT APPLIES
4	TO W1033 CABLES ALSO.
1	MIGHT MESS UP IF RGT IS TURNED ON BEFORE THE GENERATORS. SEQUENCE IS
2	IMPORTANT AT POWER-DOWN-MUST KEEP VOLTS RIGHT.
1	WE HAVE SOMETIMES FAILED TO LOCK RGT LEGS.
1	FORGET RGT VENT CORES-NEEDS BETTER MARKINGS.
1	RGT ALIGNMENT-ACCURACY ESSENTIAL FOR HANDOFF TO FCS. PADS HAS GIVEN
2	WRONG GRID COORDINATES. ALIGNMENT NEEDS MORE EMPHASIS IN TRAINING.
1	COMMO-RGT/GCS-TOO IMPORTANT TO USE RADIOS.
1	RGT-NEEDS TO BE ON LEVEL GROUND TO EMPLACE. OTHERWISE MIGHT ROLL OFF.
2	880 GETS STUCK EASY WITH RGT ON IT. IMPORTANT TO GET RGT OVER THE STA
3	KE.
1	LOCATIONS AND ALIGNMENT OF RGT IS IMPORTANT. PADS GAVE WRONG COORDINA
2	TES - SHOULD BE ACCURATELY SURVEYED. RESULT-POSITIONS BIRD LOOKED AT
3	WERE INCORRECT.
1	IT IS VERY IMPORTANT TO OPEN VENTS -MAKE SURE GENERATORS ARE ON 120 VO

RGT emplacement   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
2	LTS. NEED MORE GENERATOR MAINTENANCE TRAINING.
1	MUST PUT RGT ON SURVEY POINT. ALLOWED 10M ERROR. MUST HAVE MORE TRAIN
2	ING ON SURVEY THEORY. MISSION COMMANDER HELPED WITH SURVEY. RGT ALIG
3	NMENT MUST BE ACCURATE. YOU CAN ALSO SITE ON THE WRONG OS.
1	SHORTED OUT RGT. SWITCHES FOR POWER-UP MUST BE TURNED ON LEFT TO RIGH
2	T. CANNOT TURN ON BATTERY BEFORE MAIN POWER. BATTERY WILL RUN DOWN.
3	MUST EMPLACE GENERATORS WITHIN REACH OF GENERATOR POWER CABLES.
1	A FAULT WILL SHOW ON RGT PANEL AND GCS WHEN FOC IS IN PLACE. YOU MIGH
2	T SWITCH A AND B ON ONE END-FO MAY NOT WORK.
1	WE ALSO HAVE HAND-HELD WALKIE-TALKIE IN ADDITION TO W1033(LAND LINE)
2	BUT MAY HOOK UP W1033 TO WRONG POSTS.
1	GROUNDING RGT IS IMPORTANT-RGT FAULTS IF NOT WELL GROUNDED-ALSO FAULTS
2	WITH POWER SURGES. HAVE TO MAKE SURE VOLTAGE AND FREQUENCY ARE CORRE
3	CT. HAVE TO POWER UP/DOWN IN RIGHT SEQUENCE OR RGT GETS FAULTS.
1	EMPLACING FIBER OPTIC CABLE IS NOT DIFFICULT-BUT IF LEFT OUT AT NIGHT,
2	ANIMALS EAT THEM. CAREFUL TO PREVENT THEM BEING RUN OVER; ALSO PREVEN
3	T BREAKING WHERE IT HOOKS INTO BLACK BOX. SAME COMMENTS APPLY TO W1033
4	CABLE.
1	YOU HAVE TO ALIGN RGT ON OS CORRECTLY. OTHERWISE ANTENNA WILL BE OFF.
2	THIS HAS HAPPENED -USED WRONG OS. NEED MORE SURVEY TRAINING.
1	SHOULD UNLOAD EVERYTHING AT RGT SITE BEFORE THE 880 GOES TO LAY FOC.
2	SURVEY AND ALIGNMENT MUST BE ACCURATE-SITING ON WRONG OS CAUSED PROBLE
3	MS.
1	CABLES GET CROSSED; HOOKED UP TO WRONG POSTS AT RGT AND/OR GCS. CABLE
2	S MIGHT NOT BE TIGHTENED AT RGT POSTS.
1	POWER-UP SEQUENCE HAS TO BE FOLLOWED TO PREVENT RGT DAMAGE. WARM UP
2	PERIOD MIGHT BE TOO LONG. VOLTAGE AND HERTZ CHECKS ARE IMPORTANT.
1	RGT: PYLON LEG ATTACHMENTS NEED IMPROVING. BLAST LEGS KEEP GETTING IN
2	THE WAY.
1	OPERATIONS ARE SUPPOSED TO RUN THE FO CABLES SOME DISTANCE APART SO TH
2	AT A SINGLE ROUND WOULD NOT DESTROY BOTH CABLES AND CUT THE DATA LINKS
3	BETWEEN THE GCS AND RGT. THIS WAS DONE ONLY SPORADICALLY, ESPECAILLY
4	DURING THE LATTER PART OF OT II.
1	IF LEGS ARE NOT DEPLOYED RGT COULD TIP AND INJURE SOMEONE.
1	30 MINUTE RGT WARMUP ADDS TO SETUP TIME.
1	SHORTCUTS FOR RGT PROCEDURES:
2	1. UNHOOK
3	2. UNLOAD GENERATOR
4	3. LEVEL
5	4. INSTALL GROUND ROD
6	5. POWER UP BEFORE POWER TO RGT + 10 MINUTES.
1	IF RGT SURVEY PROCEDURES ARE USED BY THE BOOK, IT TAKES FIVE PEOPLE.
2	AN EASIER WAY IS TO PLACE THE THEODADOLITE 100 METERS AWAY AND SHOOT A
3	NGLES SCOPE TO SCOPE. A TWO PERSON JOB AT BEST.
1	THERE IS A CARRY/STOWAGE LOCATION ON THE RGT FOR A GENERATOR BUT IT IS
2	NOT USED. IT REQUIRES A TWO OR THREE MAN LIFT AND CARRY. WE JUST CA
3	RRY ALL GENERATORS IN THE TRUCK AND DROP THEM WHERE THEY WILL BE USED.

RGT emplacement MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	IF WE HAD A WHEELED JACK ON THE RGA TRAILER HITCH WE WOULD NOT REQUIRE
2	TWO OR THREE MEN TO UNHITCH THE RGA. WE WOULD ONLY NEED A TWO MAN AD
3	VANCE PARTY RATHER THAN A THREE MAN ADVANCE PARTY WE USE NOW.
1	THE RGT STABILIZER LATCH TO LOCK THE PALLET IS CLOSED BY PUSHING IT FO
2	RWARD. THE LATCH IS UNDER THE TRAILER AND IS VERY DIFFICULT TO REACH.
1	WHEN THE RGT IS INITIALIZED, THE MAN MUST CLIMB UP AND DOWN FROM THE S
2	COPE TO THE PANEL. THE SCOPE GIVES THE AZ AND EL THEN THE MAN MUST CL
3	IMB DOWN TO IMPUT TO THE PANEL. ITS EASY TO FORGET THE AZ AND EL. TH
4	ERE MUST BE A BETTER WAY.
1	THE SLAVE RECEPTICAL ON THE RGT DOES NOT HANDLE THE 880 CABLE. IT SHO
2	ULD.
1	THE RGT SUPPORT PAD STOWAGE STRAP IS REALLY DIFFICULT TO PASS THROUGH
2	THE PAD. THE BUCKLES DON'T FIT THROUGH THE OPENING IN THE PADS.
1	RGT: THE RGT SHOULD BE DESIGNED WITH A VOLATILE ZERO FUNCTION. THIS W
2	OULD ALLOW THE RGT TO BE LAID ON THE AZIMUTH OS TO EOL AND SET TO ZERO
3	BY PRESSING A ZERO SWITCH FROM INSIDE THE GCS, NEXT THE AZIMUTH OS TO
4	EOL WOULD BE INPUT FROM THE GCS/RGT PANEL AND ENTERED. THE RGT WOULD
5	NOW BE ALIGHNED TO THE GRID AZIMUTH. THIS ACTION WOULD DECREASE THE
6	RGT SET UP AND PRE-OP TIME BY APPROXIMATELY 20 MINUTES.
1	RGT: FIBER OPTIC CABLE - FIRST TIME SET-UP IN AM.M - LOOSE CONNECTOR
2	AT RGT. OPERATOR PROVIDE A BUFFER OF COILED CABLE TO COMPENSATE.
3	COILS SUSCEPTIBLE TO FOOT TANGLES AND DAMAGE.
1	RGT: STABLIZER PADES (FEET) HELD DOWN MECHANISM THIS IS SECOND
2	GENERATION DESIGN - FIRST HOLD DOWN MADE OF ALUMINUM SHOWED EXCESSIVE
3	WEAR (NOT AVAILABLE FOR INSPECTION IN FIELD). NEW DESIGN CREATES
4	PROBLEMS FOR OPERATORS BECAUSE OF SIZE OF TAKE-UP REEL IN RELATION TO
5	SPACE IT IS DESIGNED TO WORK IN.
1	RGT: STABILIZER BALL LOCKING MECHANISM ORIENTED IN WRONG DIRECTION -
2	CURRENTLY FACES TOWARD FRONT OF VEHICLE - PROPER ORIENTATION WOULD BE
3	TOWARD REAR. OPERATOR ACCESS IS BY CRAWLING UNDER RGT PLATFORM.

Install/Stow FO Cables MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	THE MANUAL CONVERS THINGS PRETTY WELL, BUT THE STEPS WOULD BE TIME CON
2	SUING TO FOLLOW. MANUALS NEED TO BE REWRITTEN WITH IMPUTS FROM EXPERI
3	ENCED PERSONNEL.

Install/Stow FO Cables MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	THE FO CABLE REELING MACHINE CAN BE REPLACED WITH A ROD BUT IT'S DIFFI
2	CULT TO HANDLE AND VERY TIME CONSUMING.
1	IT TAKES AN AVERAGE OF 10 MINUTES TO INSTALL THE FO CABLES. WITH ONE
2	MAN WALKING AND ONE AT THE RGT IT TAKES 5 MINUTES.

Install/Stow FO Cables MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	KINKS IN FO CABLE CAN CAUSE BREAKS. PINS CAN BEND. NAINTENANCE PERSO
2	NNEL HAVE TO TAPE CABLES AT CONNECTIONS. PROTECTIVE COVER ON CABLE CO
3	NNECTOR WON'T STAY IN PLACE.

Install/Stow FO Cables MANPRINT*PRIMARY=MOPP-NBC

Line of Comment	COMMENT
1	IF THE FO CONNEDCTORS ARE NOT SEATED PINS WILL BEND AND DAMAGE FO ASSE
2	MBLY.

Power Up the GCS MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	MPOC OPERATOR PERFORMS PERIODIC DATA INPUTS USING THE DATA LINK RACK
2	INPUT CONTROLS LOCATED AT THE OPPOSITE END OF THE GCS. THIS LOCATION
3	REQUIRES THE MPOC OPERATOR TO PASS BY THE MC, AVO AND OTHER PERSONNEL
4	IN THE VICINITY OF THE MISSION PLANNING FACILITY: SOLUTION: MOVE THE
5	DATA LINK RACK INPUT CONTROLS TO THE SPACE ON THE MPOC NOW OCCUPIED
6	BY A STORAGE DRAWER.

Power Up the GCS MANPRINT*PRIMARY=ENVIRON

Line of Comment	COMMENT
1	NOISE WOULD BE A PROBLEM IN GCS NEED A DB CHECK. RADIOS MUCH STATIC,
2	VOICES UNCLEAR. LOCATION OF GENERATOR MIGHT BE CHANGED TO AVOID OPEN
3	DOOR.

Power Up the GCS   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	MIM CODES ARE OBTAINED FROM CEOI AND PUNCHED INTO CONSOLE AT YEAR OF
2	GCS. THERE IS NO WAY TO VERIFY CODE ONCE IN. CODE(S) ARE CALLED BY
3	LAND LINE TO LAUNCHER FOR ENTRY. LAUNCHER OP COPIED CODE DOWN WRONG
4	(UNKNOWN WHETHER IT WAS VERIFIED BY VOICE). THE RESULT WAS NO VIDEO.
5	ANOTHER BIRD WAS PUT ON WITH SAME RESULT FOR SAME REASON AS CODES
6	WERE NOT CHANGED. OCCURED 87023 AND 87006 (WE THINK). LONG CODE AND
7	SHORT CODE IF DIF. AT LAUNCHER WILL RESULT IN EITHER NO VIDEO OR NO LI
1	CODES CAN BE DIFFERENT NUMBER OF DIGITS AND CAN HAVE SAME NUMERICAL
2	DIGIT REPEATED. FOR EXAMPLE, LONG CODE CAN BE SHORTER THAN SHORT CODE
3	IN NUMBER OF DIGITS.

Prepare Recovery Subsystem   MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	DON'T KNOW HOW IMPORTANT IT IS TO GROUND THE RECOVERY VEH. THIS ISN'T
2	ALWAYS DONE. ALSO 5337, 5676 AND 1687.
1	PROBLEMS WITH CAMERA ALIGNMENT ON THE RECOVERY NET. THEY GET OUT OF A
2	DJUSTMENT AND CAUSE RECOVERY PROBLEMS. ALSO 9203, 5337 AND 9977
1	THERE IS NO COMPREHENSIVE CHECKLIST FOR THE RECOVERY--YOU ALWAYS FORGE
2	T SOEMTHING ALSO 9203, 5337, AND 9977
1	RV SYSTEM HYDRAULIC CONTROL LEVERS ARE EASY TO MIS-COORDINATE--PROPRER
2	USE REQUIRES PRACTICE. ALSO 9203, 5337 AND 9977

Prepare Recovery Subsystem   MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	TRUCKS RUN OVER LINES CAUSING TANGLES. THIS IS A SAFETY HAZARD FOR RE
2	COVERY CREW. ALSO 9203, 5337 AND 9977.
1	DANGEROUS TO OPERATE RECOVERY SYSTEM UNLESS OUTRIGGERS ONE IN PLACE-TR
2	UCKS TIP OVER. ALSO 9203, 5337 AND 9977.
1	OUTRIGGERS MUST BE PUT OUT FIRST-SAFETY.

Prepare Recovery Subsystem   MANPRINT*PRIMARY=MANPWR & PRSNNL

Line of Comment	COMMENT
1	FOR RECOVERY MORE THAN 3 PERSONS IS TOO MANY - ONE EXTRA GETS IN THE
2	WAY.

Prepare Recovery Subsystem   MANPRINT*PRIMARY=COMM

Line of Comment	COMMENT
1	CAN'T FLY THE AV OVER THE RGT-CAUSES POSSIBLE RECOVERY LOCATION PROBLE
2	MS. ALSO 9203, 5337 AND 9977.

Prepare Recovery Subsystem   MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	RECOVERY FLUID TEMPERATURE GAUGE DOES NOT SEEM TO BE RELIABLE--THIS IS
2	IMPORTANT TO RETARDATION FORCE LEVERLS-- INCORRECT BRAKEING DAMAGES T
3	HE AV. ALSO 9203, 5337, AND 9977
1	RV SYSTEM HAS COMMUNICATIONS BREAKDOWNS ALSO 9203, 5337 AND 9977.
1	GAUGE MARKINGS ON RECOVERY SYSTEM ARE TOO GROSS--GRADUATE TO 1/10 INST
2	EAD OF 5/10. ALSO 9203, 5337 AND 9977
1	IT IS HARD TO SEE THE HYDRAULIC FLUID LEVEL ON THE DIPSTICK. ALSO 920
2	3, 5337 AND 9977.
1	IT IS HARD TO SEE THE HYDRAULIC VALVE LEVER-HAVE TO CRAWL UNDER THE VE
2	HICLE. (RECOVERY VEHICLE) ALSO 9203, 5337 AND 9977.
1	CIRCUT BREAKERS ON RECOVERY VEHICLE ARE HARD TO OPERATE.
1	YOU COULD MAKE A MISTAKE BY TRYING TO ADJUST THE CAMERAS BEFORE THE ST
2	RUCTURE IS ALL THE WAY UP. THE CAMERAS MUST BE TURNED OFF IMMEDIATELY
3	AFTER REOVERY.

Prepare Recovery Subsystem   MANPRINT*PRIMARY=PARTS SUPPLY

Line of Comment	COMMENT
1	PINS CLIPPED IN GUIDE PULLEYS ARE TOO SMALL--RECOVERY NET RETAINING LA
2	NGARD PINS BREAK. ALSO 9203, 5337, AND 9977
1	RECOVERY NET CABLES GET CROSSED--CAN BOUNCE OUT AND CAUSE CABLE TO FRA
2	Y--THERE IS NO STANDARD FOR KNOWING PERMISSIBLE DEGREE OF STRAND BREAK
3	AGE BEFORE CABLE HAS TO BE REPLACED. ALSO 9203, 5337, AND 9977
1	BUNGE CORDS ARE OFTEN MISSING--BUT ARE NEEDED. ALSO 9203, 5337, AND 9
2	977

Prepare Recovery Subsystem MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	CAMERAS MUST HAVE COVERS REMOVED BEFORE ERECTING THE RECOVERY BARRIER.
2	THIS IS SOMETIMES OVERLOOKED. ALSO 9203, 5337 AND 9977.
1	PREOP INSPECTION IS DONE IN HIDE POSITIONS. ALSO 9203, 5337 AND 9977.
1	TRANSPORT FIXTURE ON THE NET FRAME IS HARD TO REMOVE. SOMETIMES HAVE
2	TO HAMMER IT LOOSE. THERE IS NO TOOL FOR THIS. WE USE 2 X 4'S, ROCKS
3	, ETC. ALSO 9203, 5337 AND 9977.
1	IT IS POSSIBLE TO HOOK UP GAUGES WRONG ON THE RECOVERY VEHICLE AND GET
2	INCORRECT READINGS. ALSO 9203, 5337, AND 9977
1	RV SYSTEM CAN'T ERECT ITSELF IN LOWERED COMPLETELY. ALSO 9203, 5337,
2	AND 9977
1	LENGHT OF RECOVERY SETUP TIME DEPENDS UPON THE TACTICAL SITUATION. AL
2	SO 2521, AND 9977.
1	RECOVERY NET ARMS BEND EASILY. PADS ARE TOO SMALL. HYDRAULIC SYSTEM
2	DOES NOT MAINTAIN CONTROL OF PRESSURE ACCURATELY. ALSO 9203, 5337, AN
3	D 9977
1	(TASK RS PREOP INSP) COMMENT: TASK ESSENTIAL TO INSURE RECOVERY SYSET
2	M WILL OPERATE. ALSO 9203, 5337 AND 9977
1	INSTALLING WIRING HARNESS IS ESSENTIAL--USUALLY LEFT CONNECTED ALSO 92
2	03, 5337 AND 9977

Prepare Recovery Subsystem MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	THE BRAKE TEMPERATURE GUAGE IS NO GOOD IN HOT WEATHER. WE HAVE TO USE
2	A CONVERSION TABLE.
1	RV BRAKE PRESSURE THERMOMETOR: NEED LIGHT FOR NIGHT OPERATION. CAN'T
2	SEE THERMO METER IN DARK IT'S LOCATED TOO FAR INSIDE THE SWITCH BOX.

Prepare Recovery Subsystem MANPRINT*PRIMARY=N.A.

Line of Comment	COMMENT
1	GO-NO GO FOR RECOVERY IS AUTOMATIC. MAKE SURE CAMERAS OK WITH RGA--MI
2	STAKES ARE MECHANICAL, NOT HUMAN ERROR. ALSO 9203, 5337, AND 9977

Deploy RV Barrier Support MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	RS TRUCK IS SOMETIMES STARTED IN GEAR--DANGEROUS. ALSO 9203, 5337, AN
2	D 9977
1	AN OBSERVER IS NEEDED TO WATCH THE CABLES IN DEPLOYING THE BARRIER STR
2	UCTURE. MISTAKES COULD BE MADE BY NOT FULLY EXTENDING THE BARRIER. T
3	HE ONLY WAY YOU KNOW WHEN ITS EXTENDED IS BY THE SOUND OF THE HYDRAULI
4	CS.

Deploy RV Barrier Support MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	SAFETY: SAFETY RAILS FOR RV CONTROL PLATFORM IS SO LOSE IT IS EASY TO
2	LOSSE YOUR BALANCE AND FALL

Deploy RV Barrier Support MANPRINT*PRIMARY=CREW STATN DSGN

Line of Comment	COMMENT
1	ITS HARD TO SEE THE DETENT NUMBERS AT NIGHT.

Deploy RV Barrier Support MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	THE POSITION MARKER FOR STOWING AWAY THE NET NEEDS TO BE MOVED OVER TO
2	WARD THE STOWED POSITION.
1	WHEN #6 OPENS OPERATORS CAN'T SEE NET. CONTROLS SEEM REVERSED FOR REC
2	OVERY BARRIER OPERATION.
1	LEARNING CONTROL LEVERS IS EASY FOR THE RECOVERY OPERATION.
1	WE NEED SOME WAY OF KEEPING TENSION ON THE RECOVERY NET CABLES. ALSO
2	1557, 9977, 2521 AND 5676.

Deploy RV Barrier Support MANPRINT*PRIMARY=PMCS

Line of Comment	COMMENT
1	HYDRAULIC LEAKS ARE FREQUENT ON RECOVERY SYSTEM--HAVE TO CONTINUOUSLY
2	INSPECT LINES, VALVES, ETC. ALSO 9203, 5337, AND 9977

Deploy RV Barrier Support   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	RECOVERY 2. # 4 LEVERS HAVE TO BE OPERATED SIMULTANEOUSLY OR THE NET G
2	ETS TANGLED. ALSO 9203, 5337, AND 9977
1	HAVE TO KEEP RECOVERY ARMS EVEN.
1	THERE'S NO LEVEL CHECK EXCEPT THROUGH GCS FOR RECOVERY OPERATIONS - US
2	UALLY ONE ABORT FOR THIS REASON.
1	THERE IS A WIDE TOLERANCE FOR LEVELING THE RECOVERY BARRIER, PLUS OR M
2	INUS 7 DEGREES. ALSO 2521 AND 9977.
1	RELEASING RECOVERY BARRIER IS EASY - STOWING IT IS THE PROBLEM.
1	TRANSPORT FIXTURES BEND EASY, ARE HARD TO CLOSE-2 PERSON JOB.

Deploy RV Barrier Support   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	DETENT RING, RV: NEED REFLECTIVE MATERIAL ON DETENT RING INORDER TO SE
2	E DETENTS AT NIGHT
1	SWING BACK PULLY: SAFETY PIN THETHER CABLE/WIRE BREAKS AS PULLY TWISTS
2	DURING RECOVERY
1	RV NEEDS A COLORED CAP OR MAYBE A MICROSWITCH ON THE RGA LENS CAP SO W
2	E DON'T DEPLOY THE RV BARRIER WITH THE RGA LENS COVERED.
1	RECOVERY SUBSYSTEM: SINCE THE 2 EA # 4 LEVERS AT SOME POINT MUST BE U
2	SED TOGETHER IN DEPLOYING THE BARRIER STRUCTURE, AT THAT TIME THE OPER
3	ATOR SHOULD BE ABLE TO LOCK THEM TOGETHER SO THAT THEY WILL CAUSE THE
4	PROPER ACTION WITH ONE HAND MOVEMENT MOTION.
1	RECOVERY SUBSYTEM: THE BAG NET REQUIRES A CONSIDERABLE EFFORT TO FOLD
2	AND CONNECT TO THE BARRIER STRUCTURE. THE ORIGINAL NET WAS NOT OF TH
3	E BAG BARIETY, NO SPECIAL EFFORT WAS USED TO STORE IT. THIS NET WAS K
4	EPT IN A LARGE PLASTIC BAG AND WAS ATTACKED TO THE RECOVERY AFTER THE
5	BARRIER WAS DEPLOYED. STRONG BUNGE CORDS WERE ATTACHED TO THE CABLES
6	WHICH ELIMINATED CABLE TANGLING. RECOMMED A SINCERE RELOOK AT THE BAG
7	NET VS THE NON BAG NET.
1	RECOVERY VEHICLE: THE 250 BAR GAUGE USES THE SAME HUDRAULIC GAUGE EXT
2	ENSION LINE AT M14 AS THE 25 BAR GAUGE WHICH CONNECTS TO THE LOW PRESS
3	URE POINT M9. SINCE THE EXTENSION FITS BOTH CONNECTIONS THE LOW PRESS
4	URE 25 BAR GAUGE COULD BE CONNECTED TO THE HIGH PRESSURE SIDE. RECOMM
5	END THAT THE CONNECTIONS BE REDESIGNED SO THAT A CONSIOUS EFFORT MUST
6	BE MADE TO CHECK THOSE PRESSURES OR PRESSURE CKECKING ELIMINATED ENTI
7	RELY.
1	BRAKE CABLE HOOKED OR BOUND ON THE RESTING POLE AND NET HAD TO BE LOW
2	ERED TO STRAIGHTEN IT OUT. THE RESTING POLE STICKS UP BETWEEN THE BRAK
3	E ASSEMBLY AND THE OUTER ARM APPROX 1035HRS
1	SWINGBACK PULLY. SAFETY PIN ON SWING BACK PULLY IS TO SMALL TO HANDLE
2	ESPECIALLY A PROBLEM DURING MOPP (GLOVED) OPERATIONS. NEED A BIGGER PI
3	N

Deploy RV Barrier Support   MANPRINT*PRIMARY=MOPP-NBC

Line of Comment	COMMENT
1	MORE TRAINING IS NEEDED FOR CORRECTING PROBLEMS SUCH AS TWISTED CABLES
2	AND NETS. FOUR PEOPLE ARE NEEDED BUT A MINIMUM OF TWO IS NEEDED.

AV from Container to Stand   MANPRINT*PRIMARY=TOOL SUPPLY

Line of Comment	COMMENT
1	CASKET LIDS: THE FOUR CABLES ON SLING BREAK STRANDS RAPIDLY. SAFETY:
2	LIDS ARE OFTEN LIFTED OVER THE HEADS OF PEOPLE. NEED TO KNOW WHEN CABL
3	ES SHOULD BE REPLACED

AV from Container to Stand   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	REMOVING LIDS FROM AV CONTAINERS IS DIFFICULT
1	REMOVING LIDS FROM AV CONTAINERS IS DIFFICULT.
1	REMOVING LIDS FROM AV CONTAINERS IS DIFFICULT. THE LATCHES ARE TOO WE
2	AK. THEY BECOME DAMAGED, THEN CAN'T BE OPENED.
1	REMOVING LIDS FROM AV CONTAINERS IS DIFFICULT. THE LATCHES ARE TOO
2	WEAK. THEY BECOME DAMAGED, THEN CAN'T BE OPENED.
1	THE AV STANDS ARE WEAK. THEY WARP AND BEND. THE SPOT WELDS BREAK. T
2	HE STANDS SHOULD BE MADE FROM STEEL-PREFERABLE STAINLESS SO THEY WON'T
3	RUST.
1	THERE ISN'T ENOUGH ROOM ON THE TRUCK TO WORK AROUND THE AV STAND.
1	THERE ISN'T ENOUGH ROOM ON THE TRUCK TO WORK AROUND THE AV STAND.
1	SOMETIMES AV STAND PINS ARE DIFFICULT TO INSERT AND REMOVE. ALSO 0605

AV from Container to Stand   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	AV CONTAINERS ARE HARD AND HEAVY TO OPEN. CAN'T THEY BE HINGED OR MAD
2	E IN A WAY THAT IS EASIER TO HANDLE? WHY NOT SIDE OPENING CONTAINERS?
1	WHEN THE AV STOWAGE CONTINERS ARE STOWED ON THE GROUND THEY NEED TO BE
2	BLOCKED UP TO KEEP THE GASKETS CLEAN. WE HAVE NO MEANS OR DEVICE TO
3	KEEP AV CONTAINER GASKETS CLEAN.

AV from Stand to LV   MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	AIR VEHICLES HAVE BEEN LIFTED WITH THE STAND STILL ATTACKED BY ONE OR
2	MORE PINS.
1	THERE IS POTENTIAL FOR AV MUSH AND LING WHILE TRANSFERRING IT TO THE S
2	HUTTLE (DROPPING, HITTING PART OF THE LAUNCHER, ETC)
1	AGREE THAT THERE IS DANGER OF DAMAGE TO AV WHILE PUTTING IT ON THE LAU
2	NCHER. THIS TASK REQUIRES CARE.

AV from Stand to LV   MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	SAFETY: AV LAUNCHER WINCH CRANK HANDLE SLIPPED, SPUN BACKWARD, HIT OPE
2	RATOR ON WRIST. DID NOT BREAK WRIST.
1	SAFETY/EQUIPMENT HAZARD: AV LAUNCHER WINCH CABLE SNAPPED WHILE LIFTING
2	AV FROM STAND. NO DAMAGE THIS TIME AS AV DROPPED ONLY A COUPLE OF
3	INCHES
1	LAUNCHER: AV LOADER DEP. 55-1550-200-10-3 PG 2-829 LOWER AV LOADER TR
2	ANSIT HOLDER HAS SHARP EDGES. SOME OPERATORS HAVE GOTTEN CUTS FROM TH
3	IS ITEM: RECOMMEND THAT THIS PEDESTAL BE ELIMINATED AND THE MICRO SWI
4	TCH BE ATTACHED TO THE CENTER OF THE AV LOADER PIVOT POINT.

AV from Stand to LV   MANPRINT*PRIMARY=TOOL SUPPLY

Line of Comment	COMMENT
1	AV HANDLING: WOULD HELP TO HAVE HYDRAULIC CRANE ON LV. YESTERDAY RATCH
2	ET ON CRANE SLIPPED. AV DROPPED BUT FELL ON TO CRADLE UNDAMAGED.
1	FUEL SERVICE PUMP: VAPOR LOCK OCCURS OFTEN. MAINTAINER THEN HAS TO DIS
2	ISEMBLE PUMP. IF AIR POCKETS OCCUR IN AV BLADDER THEN WE CAN'T TELL FI
3	LL LEVEL AND MUST DRAIN AV AND REFILL AV.
1	LAUNCH PREP - WING ATTACHMENT MATING PROCESS SLOW AND CUMBERSOME
2	FITTING TOLERENCE ARE VERY TIGHT. WING RETAINER PINS DIFFICUTL TO PLA
3	CE AND ALIGN. NO STANDARD TOOL AVAILABLE FOR JOB RECOMMEND LEATHER OR
4	PLASTIC MAUL BE MADE AVAILABLE VARIOUS IMPROVISED TOOLS HAVE BEEN
5	SEEN IN USE - FLASH LIGHT, TEN PEG, SCREWDRIVER, SAFETY WIRE PLIERS.

AV from Stand to LV   MANPRINT*PRIMARY=PARTS SUPPLY

Line of Comment	COMMENT
1	AV SUPPORT STNADS ARE FRAGILE. THEY WARP AND DON'T FIT. ALSO, ALL AV

AV from Stand to LV MANPRINT*PRIMARY=PARTS SUPPLY

Line of Comment	COMMENT
2	'S AREN'T EXACTLY THE SAME SIZE OR SHAPE. THIS COMPUNDS THE PROBLEM.

AV from Stand to LV MANPRINT*PRIMARY=MAINT PROC

Line of Comment	COMMENT
1	AGAIN, THERE IS NOT STANDARD TO TELL US WHEN TO REPLACE THE AV HOIST C
2	ABLES THAT HAVE BROKEN STRANDS. YOU CAN DROP AV'S.

AV from Stand to LV MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	AIR VEHICLE SLING HOOKS ARE OFTEN DIFFICULT TO RNGAGE. ALSO 2521, 060
2	5 AND 9977.

Prelaunch Operations MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	IT IS IMPORTANT TO REMOVE ELEVON CLAMPS. BUT NO ONE HAS HAD THIS HAPP
2	EN.
1	SOMETIMES WE DON'T REMOVE ALL THE AV LOADER LOCK PINS.

Prelaunch Operations MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	TWO SMASHED THUMBS- METAL ON SHUTTLE WORE DOWN AND WOULDNT CLOSE THE
2	MICROSWITCH INDICATING SHUTTLE WAS ALL THE WAY BACK WHEN IN LAUNCH
3	SEQUENCE. NOT IN LS IT WAS OK. OP TRIED TO CHECK MICROSWITCH WITH
4	THUMB, AND SOMEONE ELSE PUT SYSTEM INTO SEQUENCE WHICH CLOSED THE
5	BOLT TO CLOSE THE SWITCH. THE HYDRAULICS HAVE 1750 LBS OF PRESSURE.
6	THUMB WAS INJURED TO EXTENT OP MAY LOSE NAIL. SECOND OCCURRENCE WAS
7	APPROXIMATELY 20 MINUTES LATER.
1	PLEASE ENCLOSE THE ENTIRE LAUNCHER RAIL BASE BEFORE WE BREAK PIPING OR
2	LOSE OUR FINGERS. CREWMEN PLACE THEIR HANDS ON THE BALLISTIC SHIELD W
3	HEN WORKING ON THE AV. WHEN THE SYSTEM IS PRESSURIZED THE PIPING MOVE

Prelaunch Operations MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
4	S PINCHING HANDS BETWEEN THE PIPING AND BALLISTIC SHIELD.
1	THE SUPPORT OR SECURE BRACE FOR THE LV CRANE IS RIGHT IN A WALKWAY AND
2	INJURES OUR LEGS. ISN'T THERE A BETTER PLACE FOR THE BRACE MICROSWIT
3	CH? GET RID OF THE CRANE SECURE BRACE AND MOVE THE MICROSWITCH.

Prelaunch Operations MANPRINT*PRIMARY=CREW STATN DSGN

Line of Comment	COMMENT
1	TRANSPORT AND LAUNCH VEHICLES WORK SPACE FOR HANDS ON ASSY WORK ON AV
2	RESTRICTED ON ALL SIDES. FOOT OBSTRUCTIONS (IE. STORED LADDERS, GAS
3	CANS, HOLD DOWN) ARE ALL OVER - LAUNCHER HAS NARROW WORK SPACE AROUND
4	AV
1	AVO MUST LEAVE CONSOLE TO ENTER EDIT DATA ON TTY. CAN'T SEE BOTTOM
2	LINE BECAUSE OF WINDOW BEING SMALL AND ROLLER IN THE WAY, MUST HIT
3	RETURN TO CHECK TYPING.
1	CAN'T SEE LOST LINK INDICATOR LIGHTS WHILE WATCHING CONSOLE (FLASHING
2	LIGHTS WOULD HELP MUST CONSTANTLY LOOK UP AND DOWN TO SEE ALL DATA
3	AND INDICATORS - REQUIRES SOME REFOCUS.
1	MPO NEEDS FOOT SWITCH. MC SAYS THERE ARE TIMES WHEN HE MUST TALK ON RA
2	DIO AND CAN'T AFFORD TO USE A HAND FOR THE PUSH TO TALK SWITCH (LATER
3	SAID THIS WOULD BE UNLIKELY IN OPERATIONAL SETTING)
1	AN EMPENAGE FOR A DRAWER LOCKS STICKS OUT UNDER THE AVO POSITION. AVO
2	CAN HURT KNEE MOVING BETWEEN CONSOLE AND TTY OR WHEN MOVING FORWARD TO
3	LET SOMEONE PASS BEHIND.
1	MOVE LADDER - LEAVE PANEL WHERE IT IS FOR SAFETY (BEHIND AV)
2	LADDER ON SIDE OF TRUCK BED WOULD MAKE ACCESS EASIER ONCE AV IS ON
3	LAUNCHER.

Prelaunch Operations MANPRINT*PRIMARY=COMM

Line of Comment	COMMENT
1	RADIOS NOT WORKING PROPERLY - TOO MUCH OR TOO LITTLE REFLECTION WAS A
2	SCREW IN BOTTOM OF ANTENNAE - WORKED LOOSE AND WAS ARCING. PROBABLY
3	FROM PULLING DOWN OR REMOVING. TIGHTENING IT UP FIXED THE PROBLEM.
4	AK-MASK NEED A PMCS CHECK ADDED, ONE RPV MAN THINKS THEY WERE ADJUSTED
5	BACKWARDS BY A GCS CREWMAN.

Prelaunch Operations MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	MC CAN'T SEE LED DISPLAY WHILE STANDING UPRIGHT. BUTTONS ARE TOO LOW.
2	(COULD BE MOVED UP?)

Prelaunch Operations MANPRINT*PRIMARY=ANTHRO & BIO

Line of Comment	COMMENT
1	4 PEOPLE 45-60 MINUTES BOC SET UP
2	4 PEOPLE 90 MIN MOPP BOC SET UP
1	020487: BOC: MOPP TALKING ON RADIO DIFFICULT BOC VEHICLE WOULD BE
2	IMPROVEMENT OVER TENT.
1	020487: CONNECTING RADIO: IN MOPP 4 A PROBLEM. REMOTES FOR RADIO
2	HARD TO SET-UP MAP BOARD SET UP DIFFICULT IN MOPP 4.
1	020487: 1ST SGT, BC, XO 13T ALL IN BOC. 1ST SGT SHOULD ROAM AREA C
2	CHECKING ON TROOPS.

Prelaunch Operations MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
1	PREPARE AV FOR LAUNCH TM DEP 55-1550-200-10-2 PG 2-256. ALL WARNINGS
2	SHOULD BE CONDENSED UNDER ONE HEADING. ALL CAUTIONS SHOULD BE
3	CONDENSED UNDER ONE HEADING. THIS APPLIES TO CAUTIONS AND WARNINGS
4	THROUGHOUT THE COMPLETE TM SERIES.
1	TM DEP 55-1550-200-10-3 TASK 2-28 ACTIVATE AND CHECK OUT LAUNCH SUB-
2	SYSTEM CONDENSE ALL CAUTIONS AND WARNINGS AND NOTES. MANY OF THEM ARE
3	SIMILIAR AND SPREADED THROUGHOUT THE TASK. ONCE CONDENSED MOVE THEM
4	TO THE BEGINNING OF THE TASK.

Prelaunch Operations MANPRINT*PRIMARY=MAINT PROC

Line of Comment	COMMENT
1	AV'S COME BACK FROM MAINTENANCE AND DON'T FLY. I PUT NEW BIRDS LAST A
2	ND FLY ONE THAT WORKS UNTIL IT DROPS.

Prelaunch Operations   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	INITIALIZING THE MICNS IS A VERY IMPORTANT TASK
1	AV FUEL BLADDER MUST BE EMPTY WHEN YOU START FUELING SO THAT YOU KNOW
2	EXACTLY HOW MUCH FUEL IS ON BOARD BEFORE LAUNCHING. DEFUELING IS AN
3	IMPORTANT TASK. ALOS 5676.
1	MIGHT BE BETTER TO HAVE THE COMMO REEL MOUNTED ON THE LAUNCH VEH. LIF
2	TING IT IS HARD. ALSO 5676.
1	SWITCH FOR WEIGHT OF AV, WE ASKED WHY A SETTING FOR WEIGHT OF THE AV
2	WAS NECCESSARY IF THE AV WAS ALWAYS FULLY FUELED. THE ANSWER WAS THAT
3	THE AVS WERE NOT ALL THE SAME WEIGHT. REPAIR OF VEHICLE USUALLY
4	RESULTED IN INCREASED WEIGHT. EACH AV HAD TO BE WEIGHED AFTER REPAIR
5	BEFORE IT COULD BE USED AGAIN. FAILURE TO HAVE SWITCH IN PROPER
6	POSITION COULD POSSIBLY RESULT IN A LAUNCH FAILURE.
1	HARD OR IMPOSSIBLE TO INITIALIZE MICONS IN THE DARK. CAN'T READ THE DA
2	TA SHEET. ALSO, CAN'T HEAR COMMANDS OVER THE TELEPHONE SETUP WHEN ENG
3	INE IS RUNNING.
1	WHEN FULLY DEPLOYED YOU WOULD HAVE THE CLRS AND ONE COULD LAUNCH IF TH
2	E OTHER COULD NOT. THERE WOULD BE THREE FCS'S OUT THERE.
1	LAUNCH: ABORTED LAUNCH AV CHANGE EXHAUST FROM TRANSPORT VEHICLE DISCH
2	ARGES DIRECTLY ONTO CREW STATION OF LAUNCH ASSY. CREW - TRANS. VEHICLE
3	ORIENTED 180 DEGREES FROM POSITION STATED IN SOP
1	THE TIMELINESS OF THE RPV IS QUESTIONABLE. THE RPV NEVER COULD LAUNCH
2	ON TIME. THE LAUNCHING OF THE BIRD NEEDS TO BE TIME SENSITIVE WITH T
3	HE BATTLE. IF IT'S NOT READY TO LAUNCH, LEAVE IT ON THE RAIL READY TO
4	LAUNCH.
1	SOMETIMES YOU'D HAVE TO REVAMP THE MISSION PLAN; E.G., WHEN THE THREAT
2	IS MOVING AND THERE IS A DELAY IN LAUNCHING THE RPV, THE THREAT COULD
3	MOVE QUITE A DISTANCE.

Prelaunch Operations   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	LAUNCH PREP FUELING OPERATOR: CREW FELT VAPOR LOCK WAS PRESENT.
2	ACTUALLY CLOGGED FUEL FILTER WAS CAUSE. TROUBLE SHOOTING PROCEDURE DI
3	D NOT DETECT THE PROBLEM.
1	THERE IS A LOT OF TENSION PLACED ON THE LV UMBILICAL CORD TO THE AV DU
2	RING LAUNCH. IF THE CORD IS LOOSE OR TOO TIGHT LAUNCHING COULD CAUSE
3	DAMAGE TO THE CORD.

Prelaunch Operations   MANPRINT*PRIMARY=MOPP-NBC

Line of Comment	COMMENT
1	FINAL LAUNCH INSTRICTIONS NOT AUDIBLE TO OP IN MOPP4 GEAR. MASK REMOVE

Prelaunch Operations MANPRINT*PRIMARY=MOPP-NBC

Line of Comment	COMMENT
2	D TO ALLOW HEADPHONES TO FUNCTION

Enter and Verify Mission Plan MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	(NEED R & I TRAINING) SUN ANGLES, SHADOW ETC. NEED MORE ON TECHNIQUE
2	S FOR AVOIDING PAYLOAD VIEW PROBLEMS. (HOW TO FIND TARGETS WITH THE P
3	AYLOAD).
1	TRAINING SHOULD EMPHASIZE MISSION PLAN VERIFICATION AND FIELD SITE SET
2	-UP.

Enter and Verify Mission Plan MANPRINT*PRIMARY=COMM

Line of Comment	COMMENT
1	WANT TO ENSURE GOOD COMMO-CHECK FREQ. AND CODES/NAMES IN CASE OF JAMMI
2	NG.

Enter and Verify Mission Plan MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	SITE SETUP DATA ESSENTIAL TO ACQUIRE THE AV-HAS TO BE VERIFIED BEFORE
2	LAUNCH. AFTER DATA INPUT YOU LIST AND CHECK-EDIT ERRORS OUT BEFORE AV
3	HANDOFF. MISSION DATA GOES DIRECTLY INTO COMPUTER. YOU HAVE TO ENTE
4	R "WAYPOINT 99" TO RECALL AV. IF YOU LEAVE IT OUT YOU HAVE TO REENTER
5	IT.
1	HAVE TO CALCULATE AZ/EL TO LOST-LINK WAYPOINTS-NEED TO PICK UP AV'S.
2	THEY ONLY CAN ENTER WHAT SOMEBODY GIVES THEM. IF FAR OFF, YOU CAN'T R
3	EESTABLISH LINK.
1	IT IS IMPORTANT TO HAVE ACCURATE DATA FOR CUED TARGETS. HAVE TO VERIF
2	Y MISSION PARAMETERS FROM CLRS.
1	YOU HAVE TO HAVE ACCURATE WEATHER DATA TO DECIDE AV OPERATING ALTITUDE
2	. WE HAVE MADE ALTITUDE SELECTION ERRORS. THIS CAUSES TARGET DETECTI
3	ON PROBLEMS.
1	HANDOFF MISTAKES-NOT PUTTING IN GRID-TRANSMITTER NOT TURNED OFF-RESULT
2	: HANDOFF FAILURE.
1	INPUT MIV DATA; HAS TO BE RIGHT-WRONG NUMBERS, RGT WON'T TALK TO AV (I
2	THINK) NO ACQUISITION OF AV.
1	RUN RGT TESTS: MAKE SURE NO FAULTS. PRESS TEST ALL. HAVE TO RUN AUTO

Enter and Verify Mission Plan MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
2	CAL ON RGT-MUST BE CALIBRATED TO CORRECT CHANNEL TO TALK TO AV. PRE-
3	PLANNED YOU HAVE TO GO IN AND EDIT; PEOPLE WALKING AROUND SLOW YOU DOW
4	N. RADIO CALLS DISRUPT IF YOU ARE THE ONLY ONE THERE.
1	HAVE HAD SITUATIONS WHERE INCORRECT SITE SETUP DATA WAS ENTERED. YOU
2	MUST VERIFY DATA THAT WAS ENTERED IN THE COMPUTER. PEOPLE READ MAPS I
3	NCORRECTLY. HAVE TO MONITOR NDU TO CHECK CORRECTNESS OF MISSION DATA
4	INPUT. MISCALCULATIONS OF AZ-EL-BIRD ISN'T WHERE IT SHOULD BE. ANTEN
5	NA IS NOT POINTING AT IT. MUST INSURE CUED TARGET IS REFERENCED TO A
6	LANDMARK. MAY ENTER THE WRONG GRID FOR THE LANDMARK. (MANY PROBLEMS D
7	UE TO LACK OF MAP READING PROFICIENCY).
1	MC DOESN'T HAVE TIME TO ATTEND TO THE DETAILS OF THE MISSION.
1	MUST HAVE CORRECT BAROMETRIC PRESSURE + 100 MB. CAN MISS A WEATHER UP
2	DATE.
1	HANDOFF: INCORRECT GRID + ALTITUDE; AJ MODE ON OR OFF -CLASSIFIED CODE
2	S MUST BE IDENTICAL. ACCIDENTALLY PUNCHING IN THE WRONG CODE 1 TO 6 D
3	IGITS; TELLS RGT WHERE TO LOOK FOR AV. INCORRECT MODEM NUMBERS (1-7)
1	NEED MORE TRAINING ON: DMD OPERATIONS
2	________________________USE OF FIRE DATA (FIRE ADJUSTMENT)
1	PAPER HAS RED STRIP IF LOW (TTY)
1	RGT TESTS: WANT RGT TO DO WHAT IT IS SUPPOSED TO DO. IF YOU CHANGE CH
2	ANNEL CODES AC CLEARS OUT MEMORY + D'S RGT FAULTS. WRONG SERVO MODE 1
3	-7.
1	SEND LAUNCHER OPERATOR ADT AZ/EL/AJ MODES/CODES; USUALLY WRONG PN CODE
2	S-PN CODES EASIEST TO FORGET. (SHOULD BE AUTO INPUT FROM GCS TO LAUNCH
3	ER CONTROL-AV INITIALIZER.)
1	HAVE HAD FUEL PROBLEMS WITH GENERATORS. ON 1.5-WRONG TANK SETTING (RG
2	T) ON 30 KW-DIDN'T CHECK TANK FUEL LEVELS.
1	USE WRONG GRIDS-DEFEAT SURVEY-MIGHT NOT CATCH THIS ERROR. ALSO WRONG
2	WAYPOINT GRID CAN BE ENTERED. HAVE ENTERED WRONG AZ-EL DATA. IF FUEL
3	IS OFF, YOU DON'T KNOW FLIGHT TIME ACCURATELY.
1	ALIGN MAP-NDV-INCORRECT ALIGNMENT AT TOP RIGHT/LOWER LEFT.
1	MAY ENTER WRONG BARO PRESSURE-MAKES AV FLY AT WRONG ALTITUDE. MISMATC
2	H OF GRID OR ALTITUDE-MESSES UP HANDOFF. YOU CAN UT IN WRONG SERVO MO
3	DES, ETC CAN CALIBRATE AUTO CAL ON WRONG CHANNEL. ANY OF THESE ERRORS
4	CAN CAUSE LOST LINK OR HANDOFF FAILURE.
1	NOT CHECKING GENERATOR FUEL HAS CAUSED FAILURES.
1	THE ONLY ENTRIES REQUIRED ARE WAYPOINTS 1 AND 2 PLUS LOST LINK-REST CA
2	N BE AFTER LAUNCH. (USUALLY IS BECAUSE OF TIME). MISTAKES-GRID, AZ/EL
3	,WEATHER/ALTITUDE DATA INPUT ERRORS. ERRORS DUE TO ;BAD SURVEY, BAD M
4	AP READING, INPUT TYPING MISTAKES- ETC. THE SAME APPLIES TO THE NDU M
5	AP.
1	AV WEIGHT IS OFTEN OVERLOOKED. THIS AFFECTS LAUNCH, FLIGHT DURATION,
2	ALTITUDE, ETC.
1	RGT-1.5 KW FUEL TANKS AREN'T SWITCHED WHEN NECESSARY.
1	DATA ENTRY MISTAKES CAUSE PROBLEMS BUT I DON'T KNOW EXACTLY THE SOURCE
2	OF THE ERRORS. ERRORS (WRONG COORDINATES, ETC.) CAN BE CORRECTED. A
3	LTITUDE IS CRITICAL. BAROMETRIC PRESSURE DATA INPUT CONTROLS ALTITUDE
4	. INCORRECT FUEL WEIGHT CAUSES MISSION DURATION MISCALCULATIONS.
1	NDU MAP MISALIGNMENT CAUSES YOU TO THINK THE AV'S AT THE WRONG LOCATIO
2	N. WE CATCH THAT DURING MISSION PLOT.

Enter and Verify Mission Plan MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	WE TURNED TRANSMITTER OFF TOO SOON ON A HANDOFF-BUT IT HAD LINK WITH T
2	HE CLRS SO WE DIDN'T LOSE IT (COULD HAVE THOUGH). HANDOFF HAS TO BE CO
3	RRECTLY COORDINATED BETWEEN FCS-CLRS.
1	MUST INPUT MODE/MIU DATA CORRECTLY-OTHERWESE, NO LINK. COMPUTER SETS
2	ITS OWN MODE. YOU COULD GET SERVO MODE FAILURE FROM AN ACCELERATED SL
3	EW RATE.
1	OTHER FCS: SOMETIMES IT IS EASIER TO ENTER A NEW FLIGHT PLAN THAN REV
2	ERSE AN OLD ONE. OTHER TIMES WE JUST GET DISTRACTED.
1	INCORRECT DATA INPUT CAUSES PROBLEMS. THERE ARE SEVERAL CAUSES FOR ER
2	ROR IN DATA. INCORRECT NUMBERS; INCORRECT ENTRY. BUT EVERYTHING IS C
3	AUGHT IN VERIFICATION. COULD HAVE AV CRASH-GO INTO RESTRICTED AIRSPAC
4	E. COULD CATCH WAYPOINTS ON NDU. COULDN'T CATCH ALTITUDE.
1	COULD FAIL TO LOOK IN RIGHT PLACE. COULD SAY "NO TARGET" WHEN THERE I
2	S ONE. ALSO THERE HAVE BEEN WRONG FUEL ESTIMATES BY CLRS-NOT FCS. HA
3	VE HAD ALTITUDE ERRORS. (1100 VS 1300) IF AJ CEOI CODES ARE WRONG, WON
4	'T GET VIDEO FROM AV.
1	RGT AUTO CAL MUST HAVE ALL LINKS OR YOU GET A FAULT-HAVE TO CALL MAINT
2	AFTER SECOND TRY-FAULT.
1	IF TTY PAPER RUNS OUT YOU LOSE TIME-NOT A PROBLEM. POSITION DATA ENTR
2	Y MUST BE ACCURATE. IF PLAN ISN'T STORED COMPUTER WILL TELL YOU. WE
3	USE BVCS-IF ERROR, COMPUTER WILL CHANGE THE DATA, SO ERROR WON'T MATTE
4	R.
1	CHECK CUED TARGET DATA: CRITICAL BE SURE YOU SEE TARGETS. YOU WON'T G
2	ET CUED TARGET LIGHT IF TARGET HASN'T BEEN INPUT. NDU MAP ALIGNMENT,
3	CALIBRATION ARE CRITICAL TO KNOW WHERE AV IS ACTUALLY. PN CODES ESSEN
4	TIAL TO FLY AJ. NO HANDOFF IF WRONG CHANNEL ON EL. WE ALWAYS INPUT 2
5	00 MLS MIV.
1	REVISIONS & ADDS MAY TAKE LONGER THAN A NEW PLAN. TYPING SPEED AFFECT
2	S INPUT TIME.
1	MISSION PLANNING WHILE A FLIGHT IS IN PROGRESS: MISSION FLIGHTS DURIN
2	G OT WERE SPACED OUT. NEVER OVERWHELMED FCS WITH THE TWO MISSIONS AT
3	A TIME. NEEDS TO BE AN INTERFACE BETWEEN FCS MISSION COMMANDER AND TH
4	E TOC. NEEDS TO BE SOME FACE-TO-FACE INTERACTION.
1	WANT TO AVOID HAVING NO PAPER IN TTY DURING MISSIONS RED LINE.
1	WE GET MISSION ORDER AND DON'T HAVE TIME TO PLAN THE MISSION. WHEN TH
2	E AV GETS TO A WAYPOINT WE HAVE TO FIGURE OUT WHAT AV SHOULD DO OR LOO
3	K.

Launch AV MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	OFT IS ALL A PERSON NEEDS TO OPERATE THE LAUNCHER.
1	MORE HANDS-ON TRAINING IS NEEDED FOR LAUNCH OPERATORS ALSO 1557

Launch AV MANPRINT*PRIMARY=OPER PROC

Line of Comment | COMMENT

1 LAUNCHER HAS PLUS OR MINUS 7 DEGREE LATITUDE JUST LIKE THE RECOVERY SY
2 STEM. ALSO 1687 AND 2521.
1 ADJUSTING TRUCK RPM TO 1200- MAKES NO DIFFERENCE WHAT RPM YOU USE FOR
2 LAUNCHER.
1 BIT/BITE CHECKOUT IS IMPORTANT. IF IT FAILS, YOU GET AN ABORT.

Perform Handoff MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment | COMMENT

1 TECHNICAL OPERATION: LAUNCH & RECOVERY CREW DOES NOT NAVE ANY IDEA OF
2 WHAT THE TACTICAL SITUATION IS. THIS IS BECAUSE THERE IS NO MEETING
3 OF THE MINDS PRIOR TO BATTLE (RPV FLIGHTS). KEEPING THE SOLDIER INFO
4 RMED OF THE SITUATION IS THE MOST IMPORTANT ELEMENT OF BATTLE (RPV MIS
5 SIONS).
1 TACTICAL OPERATIONS: DURING OT II THE RPV EQUIPMENT PLACEMENT ON THE
2 GROUND DID NOT LEND ITSELF WELL TO A WARTIME ENVIRONMENT. GENERATOR E
3 XHAUST 2ND OPERATOR PANEL LIGHTS WERE POINTED TOWARD THE ENEMY. HEADL
4 IGHTS, WINDSHIELDS, AND OTHER REFLECTIVE SURFACES WERE ALSO POINTED TO
5 WARDS THE ENEMY.

Perform Handoff MANPRINT*PRIMARY=COMM

Line of Comment | COMMENT

1 TECHNICAL OPERATIONS: DURING OT II THERE WERE A NUMBER OF TIMES WHEN
2 COMMUNICATIONS WERE MARGINAL. SOME OF THIS COULD BE ATTRIBUTED TO NOT
3 HAVING THE MASS OF THE VEHICLE POINTED TOWARDS THE STATION BEING COMM
4 UNICATED WITH. THE ANTENNA BEAM DOES HAVE A DIRECTIONAL CHARACTRERIST
5 IC.

Perform Handoff MANPRINT*PRIMARY=OPER MANUALS

Line of Comment | COMMENT

1 RECOVERY SUBSYSTEM: THE TM ADDRESSES GROUNDING THIS SYSTEM AS WELL AS
2 THE LAUNCHER. THIS WOULD APPEAR TO BE A GOOD SAFETY MEASURE. DURING
3 OT II THE SOIL AND SOIL CONTENT WOULD NOT ALLOW GROUND RADS TO BE DRI
4 VEN THE SPECIFIED DEPTH. AS A RESULT A 6-8 INCH TRENCH APPROX 6 FT LO
5 NG WAS DUG. THE GROUND ROD BURRIED LENGTHWISE FOR GROUNDING, NO SUBSY
6 STEM OR MSN FAILURE WAS CONTRIBUTED TO IMPROPER GROUNDING. PERHAPS GR

Perform Handoff MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
7	OUNDING THOSE SYSTEMS IS OVER KILL.

Perform Handoff MANPRINT*PRIMARY=MAINT PROC

Line of Comment	COMMENT
1	MAINT SHELTER: DURING OT II IT WAS FOUND THAT THE ONE MAINT. SHELTER
2	AND PERSONNEL COULD ONLY TAKE CARE OF THE ONE CLRS. IN A FULL UP RPV
3	BATTERY, THE ONE MAINT SHELTER WOULD SERIOUSLY HINDER REPAIRS. IT WAS
4	ALSO FOUND THAT THE MAINT SHELTER NEEDED A MEANS TO MOVE DEFECTIVE AV
5	'S FROM THE CLRS, CRASH SITE BACK TO THE MAINT. SHELTER OR DS/GS MAINT
6	

Perform Handoff MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	CONNO IS NEEDED FOR AZ AND EL. NOT THAT VITAL. IT CAN BE SENT BY MESS
2	ENGER OR PRC 68 RADIO. (TELEPHONES CAN BE BYPASSED?) NORMAL PROBLEMS
3	WITH TORN OR PULLED CABLES. YOU CAN'T HEAR THE PHONE RING. THE PTT
4	HEADSET IS NOT ADEQUATE.

Position AV on Gun Target Line MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	USE MISSION ORDER INSTRUCTIONS TO SELECT AMMO. MUST REPORT CLOUD HEIG
2	HT-CLOUDS STOP LASER (?) PULSE SELECTOR RATE IMPORTANT FOR COPPERHEAD
3	NOT CONVENTIONAL. IF ON LINE, YOU MAY BE ON WRONG SIDE OF TARGET-PLAC
4	E WAYPOINT ON GT2 AND FLY THERE. KEEP BORESIGHT ON TARGET-LOCATE BETW
5	EEN TURRET AND TRACKS.
1	COULD FLY FIG.8, CIRCLE, ETC. GET FLASH ON VIDEO-VIDEO JUMPS-MUST SEE
2	TO INSURE FIRING. MORE TRAINING: PLOTTING AV FOOTPRINT, PLOTTING GTL
3	-STRESS THIS WHOLE PROCEDURE FOR POSITIONING AV ON GTL.

Breaks of Lasing MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	TARGET DESIGNATION: IF I CAN'T FIND THE RIGHT TARGET BUT MISSION ORDE
2	R TELLS US TO SHOOT AT ANY TANK, WE FIND SOME IN THE AREA.
1	IT APPEARS THAT THE CONTRAST TRACKER TENDS TO TRACK DEEP SHADOWS IN TH
2	E EARLY MORNING AND LATE AFTERNOON RATHER THAT THE VEHICLE.

Breaks of Lasing MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	MPOC THE MOMENTARY CONTACT LASER FIRING BUTTON IS LOCATED ABOVE AND TH
2	E RIGHT OF THE JOYSTICK. THIS REQUIRES RIGHT HANDED OPERATORS TO REAC
3	H CROSS HANDED TO PRESS THE LASER FIRING BUTTON WITH THE LEFT HAND.
4	SOLUTION: SELECT ONLY LEFT HAND MPOC OPERATORS; REPLACE THE MOMENTARY
5	CONTACT BUTTON WITH A LASER ON/OFF SWITCH; PLACE THE LASER ON/OFF
6	SWITCH ON THE TOP OF THE JOYSTICK AND REQUIRE A CONSCIOUS ACTION TO FI
7	RE THE LASER.
1	PLACE LASER FIRING SWITCH ON TOP OF JOYSTICK AND REQUIRE PRESSURE FOR
2	FIRING SO THAT FIRING REQUIRES A CONSCIOUS ACTION
1	JOYSTICK (MPOC) IS SMALL, SMOOTH AND CYLINDERICAL MAKING CONTROL ACKWA
2	RD FOR THE OPERATOR. SOLUTION: REPLACE THE JOYSTICK WITH ONE SHAPED
3	LIKE A COMMON HOME COMPUTER OR VIDEO GAME WITH FINGER KNURLING.

Breaks of Lasing MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	IF ITS A COPPERHEAD, WE HAVE TO HAVE THE LASER IN THE TARGET MODE.
1	PULSE SECTIOR: YOU SELECT ON THE MIM PANEL. IF YOU DON'T THE COPPERH
2	EAD CAN'T TRACK. YOU CAN HAVE SEVERAL ROUNDS IN THE AIR BUT EACH ONE
3	WILL GO TO THE RIGHT TARGET.
1	ARTILLERY ADJUST: YOU COULD PUT IN THE WRONG CODE, BUT WE HAVEN'T DON
2	E IT SO FAR (COPPERHEAD?)
1	TARGET DESIGNATION: WE SHOOT COPPERHEAD IF ITS AN ARMORED VEHICLE OR
2	A COMMAND VEHICLE.

Arty Adjust Communications MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	LASER FIRES CONTINUOUSLY IF BUTTON LEFT DOWN. SHOULD NOT HAVE TRIED T
2	O USE LEFT HAND ON JOYSTICK. HAVE TO FIND TARGET. GO TO BURST MODE.
3	SETS COMPUTER SO IT "KNOWS" WHAT TO DO TO ADJUST. ARTY: ADJUST WOULD
4	N'T BE ANY GOOD.
1	FORGOT TO SELECT BURST MODE. HAVE TO INCREASE/DECREASE MAG UNTIL YOU
2	FIND SHELL IMPACTS. MUST BE SURE OPERATOR SEES IMPACT. GIVES MC SHIFT
3	DATA-LEFT/RIGHT, ADD/DROP. ONLY NNED ONE LASER BURST FOR RANGING. FI
4	RE FOR EFFECT-GO TO CENTER OF MASS-IF NO EFFCTS YOU DO REPORT.
1	20 DEGREES. FIELD-NEED TO FIND IMPACT. SOME AV'S AND MC'S USE LIGHT
2	PEN. FOR LASING JUST USE TM PROCEDURES. NEVER SHOT AT A MOVING TARGE
3	T. MORE TRAINING IS ESSENTIAL FOR BOTH CONVENTIONAL AND COPPERHEAD AD
4	JUSTMENT.
1	ARTILLERY ADJUST: TARGETS COME IN MISSION ORDER, IT HAS ENGAGEMENT CR
2	ITERIA (LIST OF PRIORITIES). IF WE SEE A PRIORITY TARGET (SOMETIMES A
3	CUED TARGET) WE CALL FOR FIRE. WE GIVE THE GRID, ALTITUDE, DESCRIPTIO
4	N AND DIRECTIONOF MOVEMENT, IF IT'S MOVING.
1	ARTILLERY ADJUST: WE GIVE DATA EITHER BY VOICE OR THROUGH THE DMD. I
2	F DIGITAL WE GET ACKNOWLEDGEMENT. IF VOICE THEY REPEAT WHAT YOU SAY.

Arty Adjust Communications MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	A REVIEW OF TAPES OF HE LIVE FIRE MISSIONS DEMONSTRATED THAT THE CENTE
2	R OF MASS OF MULTIPLE ROUND ENGAGEMENTS WAS POORLY CHOSEN BY THE GCS/F
3	CS CREWEN. THE ERRORS WERE GREATER DURING HIGH WIND CONDITIONS AS THE
4	SMOKE WAS BLOWN AWAY FROM THE IMPACT AREA VERY QUICKLY.
1	RPV PERSONNEL DO NOT KNOW HOW TO WORK WITH ARTILLERY BATTERIES. THEY
2	DO NOT EVEN KNOW HOW TO INITIATE A CALL FOR FIRE.

Arty Adjust Communications MANPRINT*PRIMARY=COMM

Line of Comment	COMMENT
1	TARGET DESTINATION: I GIVE THE BRIGADE LOCATION AND NUMBER. I GIVE T
2	HE ARTILLERY GRID, TARGET TYPE, MOVEMENT, ALTITUDE AND METHOD OF ENGAG
3	EMENT.
1	ARTILLERY ADJUST: IF I GIVE "AT MY COMMAND", THEY FIRE WHEN I CALL.
2	IF I JUST GIVE "FIRE", THEY FIRE WHEN THEY WANT.

Arty Adjust Communications MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
1	(BELIEVED TO BE SORTIE F043) SGT STEWART STATED THAT GCS FAILED TO INF
2	ORM AVTY DIVY THAT CORRECTIONS WERE GIVEN FROM 6400 MILS RATHER THAN
3	GUN TARGET LINE. AS A RESULT, AND VOLLEY WAS FARTHER FROM TGT THAN
4	FIRST. (RADIAL ERROR ON VOLLEY #1 WAS 224M, RADIAL ERROR ON VOLLEY #2
5	WAS 495M) THIS IS A FAILURE TO FOLLOW PROCEDURE ALTHOUGH IT SEEMS BOTH
6	PARTIES SHOULD KNOW AVTY PROCEDURES AND SHOULD HAVE BEEN AVOIDED.
7	CONTRIBUTE TO TRAINING ERROR OR MANUAL DEFICIENCY.

Arty Adjust Communications MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	TARGET DESIGNATION: THE MC GIVES TARGET LOCATION, TYPE OF TARGET, WHE
2	THER ITS MOVING AND ALTITUDE.

Damage Assessment MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	TELL MFO TO LOOK FOR CASUALTIES, COUNT BURNING VEH'S; DESTROYED VEH'S/
2	STRUCTURES, ETC. USE 2.7-WE DON'T SEE BODIES; OR FIRES UNLESS DIRECT
3	HIT ON SOMETHING THAT BURNS. COULD USE FILMS FOR THIS TASK. SCENE-FE
4	ATURE TRACK GIVES OP BETTER CONTROL OF PAYLOAD. WOULD USE AJ AS NEEDE
5	D.

Lost Link Reacquisition MANPRINT*PRIMARY=CREW STATN DSGN

Line of Comment	COMMENT
1	THE COMMAND LINK STATUS BOARD IS LOCATED ABOVE THE AVOC REQUIRING THE
2	OPERATOR TO RAISE HIS LINE OF SIGHT APPROX 50 DEGREES FROM A BASE LINK
3	FOCUSED ON THE DISPLAY. CONTINUOUS MONITORING OF LINK STATUS IS NECES
4	SARY, CAUSING OPERATOR FATIGUE OR NEGLECT IN MONITORING LINK STATUS.
5	APPROX 4 INCHES OF PANEL SPACE IS AVAILABLE ABOVE THE AVOC CRT WHERE
6	LINK STATUS LIGHTS CAN BE INSTALLED

Lost Link Reacquisition   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	LOST LINK: USE CHECKLIST-TAKES ABOUT 2 MINUTES. IF YOU FAIL, START AG
2	AIN. PROCEDURES SHOULD BE STRESSED IN TRAINING.
1	LOST LINK: VERY IMPORTANT; MUST BE IN SEQUENCE. LEAVE OUT A STEP. IF
2	YOU CATCH IT YOU REACQUIRE. ALLOWED X MINUTES-DEPENDS ON LOST LINK O
3	RBIT TIME YOU'VE PROGRAMMED INTO COMPUTER TRAINING: STRESS TIME FOR AC
4	QUIRE MODE SEQUENCE. AV WILL CHANGE MODES IF NOT NOT REACQUIRED. VID
5	EO FREEZE IF LINK LOST.

Perform Recovery as AV Operator   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	RECOVERY, RGA COVER: YESTERDAY WE PUT THE BARRIER UP AND LEFT THE RGA
2	COVER ON. HAD TO BRING BARRIER ALL THE WAY DOWN.

Perform Recovery as AV Operator   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	RECOVERY, COM WIRE, MOPP: COM WIRES ARE DIFFICULT TO INSERT INTO
2	TERMINALS WHEN WEARING MOPP GEAR.
1	RECOVERY MOPP: PIN ON SWING BACK PULLEY WOULD BE DIFFICULT TO REMOVE.
2	IT'S TOO SMALL.
1	RECOVERY: MOPP: PIN ON SWING BACK PULLEY WOULD BE DIFFICULT TO SEE
2	IN PLACE WHEN WEARING MASK.

Stow Recovery Subsystem   MANPRINT*PRIMARY=ANTHRO & BIO

Line of Comment	COMMENT
1	RECOVERY WIRE STORAGE: THE 70 POUND SPOOL IS TOO HEAVY TO LIFT BY ONE
2	MAN INTO ITS STORAGE LOCATION ABOVE FUEL TANK OR INTO RACK (HEIGHT OF
3	LIFT IS 6FT.)

Stow Recovery Subsystem MANPRINT*PRIMARY=ENVIRON

Line of Comment	COMMENT
1	FOUL WEATHER: NEED NON-SLIP SURFACE ON FOLDED RV BARRIER STRUCTURE. IT
2	IS DIFFICULT TO WALK ON STRUCTURE TO PLACE NET WHEN STRUCTURE IS WET.

Stow Recovery Subsystem MANPRINT*PRIMARY=PARTS SUPPLY

Line of Comment	COMMENT
1	NIGHT OPERATIONS: NO FLASH LIGHTS. NET FOLDING IS IMPOSSIBLE AT NIGHT.
2	CAN'T SEE CABLES AS STRUCTURE COMES DOWN

Stow Recovery Subsystem MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	THE RV SWING BACK PULLEY NEEDS A LARGER PIN. ITS IMPOSSIBLE TO REMOVE
2	OR INSERT WHILE MOPP GLOVES ARE WORN. THE TEATHER CABLE BREAKS AS TH
3	E HEAD SWIVELS DURING RECOVERY.
1	THE OPERATOR CANNOT SEE ALL THE THINGS THAT NEED TO BE WATCHED DURING
2	DEPLOYMENT AND STOWAGE.
1	RECOVERY SUBSYSTEM: REMOVE AND STORE TRANSPORT FIXTURE: THE BARRIER
2	STRUCTURE SHOULD BE TALLER AND LONGER, WHEN HYDRAULIC PRESSURE BLEEDS
3	DOWN THE BARRIER STRUCTURE IS HARD TO SECURE. ONCE SECURED SOMETIMES
4	A HAMMER MUST BE USED TO GET THE "C" CLAMP LOOSE.

Defuel AV MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	DIRT AND CONTAMINATION PLUG THE PUMP OPENING TO THE PUMP GAUGE. THE F
2	LUID LEVEL INDICATED ON THE GAUGE IS THEN INCORRECT.

Defuel AV MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	FUEL MIXING ALSO IS A SOURCE OF DIFFICULTY. FUEL SLOPS OUT; RATIO GET
2	S MIXED UP. SHOULD BE 50/1; OIL SPILLS OUT. NEED TO MOUNT A LARGE GA
3	SOLINE TANK UNDER THE BED AND CARRY PREMIXED FUEL UNDER PRESSURE; DO A
4	WAY WITH THE FSU
1	SAFETY AVH: FUMES FROM FUEL LEAKAGE NAUSEATE PUMP OPERATOR DURING FUEL
2	ING AND DEFUELING

Defuel AV MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	WE SOMETIMES TURN THE FUEL PUMP HANDLE THE WRONG DIRECTION OR HAVE THE
2	VALVE IN THE OPPOSITE POSITION.
1	SOMETIMES AV WINGS DON'T ALIGN CORRECTLY.
1	WE HAVE HAD A LOT OF PROBLEMS FUELING. FUELING SYSTEM LEAKS TOO MUCH.
1	A LOT OF PROBELMS FUELING. SYSTEM LEAKS. PUMPING EFFORT IS NEVER THE
2	SAME. TIME CAN VARY FROM 5 MINUTES TO 45 PLUS MINUTES FOR THE SAME A
3	MOUNT OF FUEL.
1	A LOT OF PROBLEMS FUELING, BUT NOT DEFUELING. THE PUMP SEEMS TO WORK
2	OK WHEN THE FUEL IS COMING OUT OF THE AV. ALSO THE SITE GAUGE IS PLAC
3	ED IN A SPOT WHERE IT IS DIFFICULT TO SEE.
1	AN OPERATOR TRIED TO DEFUEL THE AV WITH THE LEVER IN THE FUELING POSIT
2	ION. THIS MIGHT DAMAGE THE PUMP.
1	THE AIR VEHICLE HANDLER IS THE WORST SYSTEM OF THE RPV. IT HAS A LOT
2	OF DEFICIENCIES, BUT THE FUELING SYSTEM CAUSES US THE MOST PROBLEMS.
3	IT LEAKS, DOESN'T ALWAYS WORK, AND IS DIFFICULT TO OPERATE EVEN WHERE
4	WORKING AS DESIGNED.
1	FUEL PUMP SHOULD BE ELECTRIC OR HYDRAULIC NOT MANUAL
1	ON A HILL WE HAVE TROUBLE GETTING THE BLADDER EMPTY. ALSO 5337 AND 25
2	21.
1	FSU-A CHEAP SYSTEM. SEALS ARE ALWAYS BAD. TOP BLOWS OFF AND GAS SPRA
2	YS ALL OVER. IT GETS IN YOUR EYES.
1	FUEL VALVE LEVER ON FSU COMES LOOSE. THE ALIGNMENT CHANGES.
1	CAN'T FUEL AT NIGHT-RED LENS FLASHLIGHT DOESN'T GIVE ENOUGH LIGHT TO R
2	EAD THE GAUGES.
1	CATCHING FUEL OVERLOW HAS CAUSED PROBLEMS. THE SPACE AROUND THE OVERF
2	LOW VENT IS TOO SMALL.
1	CAN'T INSTALL AV WINGS IN THE DARK - AGAIN RED LENS LIGHTS ARE INSUFFI
2	CIENT.

Defuel AV MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	SAFETY DEFUELING: CAP ON PUMP POPS OFF FORCEABLY YESTERDAY. IT HAS
2	HAPPENED BEFORE. IT HIT OPERATOR IN THE FACE. IT CAN SPLASH GAS ON
3	OPERATOR
1	SAFETY DEFUELING: THE PUMP CAP MAY POP BECAUSE AIR IN PUMP RESERVOIR
2	GETS COMPRESSED DURING DEFUELING AS GAS IS PUMPED BACK INTO RESERVOIR
1	THE AV SERVICE PUMP GAUGE IS DIFFICULT TO READ. OVERFLOW OF THE AV OC
2	CURS BEFORE THE AV BLADDER IS FULL. THE SERVICE PUMP TRPAS AIR. CAPS
3	HAVE POOPED OFF BLOWING FUEL IN OUR FACES.
1	IF WE GET A FAULTY READING ON THE FUEL SERVICE PUMPGAUGE, WE HAVE TO D
2	RAIN AND REFILL THE AV.
1	RUEL SERVICE UNIT: THIS UNIT LEAKS FUEL MOST OF THE TIME. THIS FUEL
2	RESIDES IN THE BED OF THE AVH WHICH IS VERY UNSAFE IN THAT A SPARK FRO
3	M A DROPPED METAL TOOL OR A MAIL IN THE HEEL OF A BOOT (COMBAT), OR A
4	FUEL CAN FALLING OVER WHILE AN ASSEMBLED AV IS BEING MOVED TO OR FROM
5	THE LAUNCH VEHICLE OR MAINT SHELTER COULD IGNITE THE RAW FUEL, CAUSING
6	LOSS OF EQUIPMENT OR PERSONNEL.
1	FUELING/DEFUELING PUMP HARD TO TURN - THE SPRINGS & PLUNGERS IN THE
2	PUMP HAD GOTTEN DIRTY AND WERE STICKING. WHEN CLEANED OUT THEY WORKED.
3	CREW IS NOT AUTHORIZED TO TAKE PUMP APART ALTHOUGH THEY HAVE SOME
4	REPLACEMENT PARTS. A NEW PUMP (FROM LOCKHEED) HAS NOW BEEN INSTALLED.
5	NO SPARE PUMPS ARE CARRIED FOR THE TWO UNITS. THE SIGHT GAUGE IS
6	DIFFICULT TO READ AS OPERATOR MUST VIEW IT FROM NEAR THE BOTTOM OF
7	THE PUMP. OBSERVED 19 FEB.
1	SUSPECTED PROBLEMWITH INABILITY TO FULLY FUEL AV ON FEB 19:
2	(1) POSSIBLE AIR BUBBLE IN FUEL BLADDER
3	(2) POSSIBLE CRIMP IN FUEL BLADDER

Perform Hydraulic Slave MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	RECOVERY VEHICLE RS/LS SLAVE CAPABILITY: LAD WAS TO INSTALL A HYDRAUL
2	IC "SLAVE" CAPABILITY ON THE LS + RS UNDER FSD CONTRACT. THE "SLAVE"
3	PROCEDURE WAS DEMONSTARTED TO THE OT II PLAYERS DURING THEIR TRAINING
4	AT FORT SILL. THE DEMONSTRATION WAS ONLY ON "HOW TO" HOOK UP A SLAVE
5	VEHICLE. THE SYSTEM WAS NOT "FULLY" POWERED UP.

Perform Hydraulic Slave   MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	RECOVERY SUBSYSTEM: THE HYDRAULIC VALVE (SLAVE) UNDER THE RS PALLET I
2	S HARD TO SEE. THE OPERATOR MUST LIE ON HIS BACK ON THE GROUND, ALSO
3	THE SLAVE HYDRAULIC HOSES ARE STIFF MAKING THEM HARD TO HANDLE IN THE
4	LINITED SPACE UNDERNEATH THE TRUCK. THE PRESENT DESIGN IS UNSUITABLE
5	. RECOMMEND THAT THE HYDRAULIC SLAVE VALVES BE MOVED TO THE SIDE OF T
6	HE TRUCK NEAR THE OVE BOX PASSENGER SIDE.
1	CONNECTING THE HOSSES DURING HYDRAULIC SLAVE COVERS THE OPERATOR WITH
2	OIL AS HE CAN'T MAKE QUICK DISCONNECTION AND CONNECTION. HE IS COVERE
3	D WITH OIL WHICH RUINS CLOTHES AND COULD BE A HEALTH HAZARD.
1	RECOVERY VEHICLE RS/LS SLAVE CAPABILITY: DURING PHASE 4 OF OT II THE
2	"SLAVE" CAPABILITY WAS TO BE DEMONSTRATED. LESS THE FACT THAT AN AV W
3	AS NOT LAUNCHED AND/OR AN AV RECOVERED--PROBLEM THE SLAVE HOSES ARE VE
4	RY CUMBERSOME IN COUPLING FROM ONE VEHICLE TO ANOTHER. HOOK UPS FOR T
5	HE HYDRAULIC OIL RETURN HOSE ARE LOCATED IN A POSTION THAT MAKES IT VE
6	RY DIFFICULT AND TIME CONSUMING TO CONNECT. THE HOSE REQUIRES HOSE CL
7	AMPS TO CONNECT TO FITTINGS.
1	RECOVERY VEHICLE RS/LS SLAVE CAPABILITY: THE SLAVE CAPABILITY WAS TO
2	BE AN EMERGENCY PROCEDURE TO GET A RS OR LS OPERATINAL TO ACHIEVE A LA
3	UNCH OR AN IMMEDIATE RECOVEY. TIME IS OF THE UTMOST CONSIDERATION. R
4	ECOMMENDATION: THE FITTINGS BE RELOCATED TO MAKE THEM MORE READILY AC
5	CESSIBLE FOR THE OPERATORS TO GET TO. MAKE ALL FITTINGS OF THE QUICK
6	DISCONNET TYPE. FUTURE TEST MIGHT PROVE THAT THIS SLAVE CAPABILITY CA
7	N IN FACT HANDLE AV RECOVERY AND LAUNCH.
1	DEP 55-1550-200-10-3 EMERGENCY HYDRAULIC POWER FOR LS OR RS. THE HYDRA
2	ULIC ROTATARY VALVE, LARGE AND EMERGENCY HYDRAULIC HOSE CONNECTIONS SH
3	OULD BE MADE MORE ACCESIBLE TO THE OPERATOR. THE OPERATOR SHOULD BE A
4	BLE TO SLAVE THIS SYSTEM FROM A STAND UP POSITION. CONNECTIONS SHOULD
5	BE ATTACHED TO THE OUTER PORTION OF THE TRUCK.
1	THE "O" RING RUBBER SEAL ON THE HYDRAULIC PUMP USED FOR THE HYDRAULIC
2	SLAVE IS VERY DIFFICUTL TO INSERT AND ALIGN. THE FLUID AND HOSE CAUSE
3	IT TO SLIP OUT CONSTANTLY.
1	THE INFLEXIBILITY OF THE HOSE USED FOR HYDRAULIC SLAVING CAUSES THE HO
2	SE AND SEAL AT THE PUMP NOT TO SEAT INTO THE PUMP COLLAR. THE TORQUE
3	AND BENDING OF THE HOSE CAUSES A VERY SMALL GAP BETWEEN HOSE AND PUMP.
4	THE FLUID LEAKS RAPIDLY.
1	IF WE DO AN HYDRAULIC SLAVE IT REQUIRES ABOUT 15 GALLONS OF FLUID TO R
2	EPLENISH THE VEHICLES.
1	THE BLUE HYDRAULIC HOSE, SENDER, IS TIME CONSUMING TO CONNECT. IT DOE
2	S NOT HAVE A QUICK DISCONNECT FITTING. IT TOOK US 40 MINUTES JUST TO
3	GET THE BLUE HOSE CONNECTED FOR TEH HYDRAULIC SLAVE.
1	THE HYDRAULIC PUMP IS NOT DURABLE ENOUGH FOR USE IN HYDRAULIC SLAVING.

Task=Not Applicable   MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
1	THE HANDHOLD ON THE FCS LADDER HAS BEEN REMOVED. IT IS TOO FLIMSY TO

Task=Not Applicable MANPRINT*PRIMARY=SAFETY & HLTH HZRDS

Line of Comment	COMMENT
2	BE OF ANY VALUE AND THE SOLDIERS WER NOT USING IT.

Task=Not Applicable MANPRINT*PRIMARY=MANPWR & PRSNNL

Line of Comment	COMMENT
1	MANPOWER: PEOPLE ARE GETTING SICK. SHORT ON PEOPLE TO MAN RV WE'RE
2	DOWN TO TWO NEED THREE, DON'T REALLY NEED FOUR.

Task=Not Applicable MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment	COMMENT
1	THE JOYSTICK IS TOO SMALL AND DOESN'T MOVE RIGHT. ALSO, THE LASER FIR
2	E BUTTON SHOULD EITHER BE ON BOTH SIDES OR ON TOP OF THE JOYSTICK SO I
3	T WOULDN'T MAKE ANY DIFFERENCE WHICH HAND YOU USED ON THE JOYSTICK.

Task=Not Applicable MANPRINT*PRIMARY=OPER MANUALS

Line of Comment	COMMENT
1	TM DEP 55-1550-200-10 SERIES OFTEN REFER TO ABBREVIATED PROCEDURES
2	CONTAINED IN DEP 55-1550-200-CL. THE TM IS THE MORE STRINGENT MANUAL
3	AND SHOULD NOT REFER TO A LESS STRINGENT DOCUMENT, FURTHER IF THE
4	ABBREVIATED PROCEDURE WILL ACCOMPLISH THE TASK THEN ONLY THAT INFORMA-
5	TION SHOULD APPEAR IN THE TM, REDUCING THE NUMBER OF PAGES THAT THE
6	OPERATOR WOULD HAVE TO LEAF THROUGH.

Task=Not Applicable MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	HANDOFF: THE MPO CHECKS THE MIM PANEL TO SEE IF THE TRANSMITTER WENT O
2	FF. THE TRANSMITTER IS THEN TURNED OFF AT THE CONSOLE. I ONLY USE TW
3	O BUTTONS; " AV HANDOFF" AND "TRANSMITTER OFF".
1	HANDOFF: INITIAL FUEL WEIGHT IS RECORDED AT THE CLRS. I PUT IT IN ON
2	TTY. WE NEED THAT TO GET TIME REMAINING.
1	HANDOFF: AS SOON AS YOU KNOW THE WAYPOINT FCS TELLS GCS WHERE THE WAY
2	POINT IS. YOU USE THE BUCS COMPUTER. THE DATA GOES TO THE MIM TO TEL
3	L THE RGT. TO VERIFY, YOU GO THROUGH THE SERVO MODE, IT GIVES YOU THE
4	NUMBERS ON THE LED DISPLAY ON THE MIM.
1	WE INSURE THAT THE HANDOFF WAYPOINT IS A CIRCLE SPECIFICLY BY PUTTING
2	IT IN ON THE TTY AND VERIFYING IT.
1	HANDOFF: YOU BOOT UP THE COMPUTER AND TELEPRINTER. THE LOSING GCS TU
2	RNS THE TRANSMITTER OFF. YOU ENTER WAYPOINT 1 THEN GO TO GCS CONTROL
3	ON MIM AND IT SLEWS THE RGT TO THE LOCATION AND AQUIRES THE AV.
1	HANDOFF: WE GIVE FUEL TIME TO GCS. WE GIVE IT OCCASSIONALLY DURING
2	FLIGHT.
1	HANDOFF: WE TELL THEM HANDOFF TIME 5 MINUTES AHEAD. WHEN HANDOFF WAY
2	POINT IS PRESSED, IT COMPUTES TIME TO HANDOFF.
1	YOU HAVE TO BE SURE YOUR IN THE CLEAR MODE FOR HANDOFF.
1	IF YOU DON'T ACQUIRE WITHIN FIVE MINUTES THE ANTENNA GOES BACK LOSING
2	RGT AND THEY GET THE BIRD BACK. YOU CAN REBOOT AND TRY AGAIN WITHIN 5
3	MINUTES.
1	HANDOFF IS EASY, YOU CAN'T DO MUCH WRONG. THE ONLY PROBLEM I HAVE HAD
2	WAS FORGETTING AJ CLEAR, BUT I CAUGHT IT.

Task=Not Applicable MANPRINT*PRIMARY=N.A.

Line of Comment	COMMENT
1	FORSCOM WILL HAVE INPUT TO THE REPORT. AFTER ACTION REPORT.

Target Identification MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	OPERATORS IN GCS STATION HAVE A TASK AT HAND; RECOGNITION, IDENTIFICAT
2	ION. ORL AND INTELL INFORMATION NEEDED.
1	NEED THE LOOK DOWN ANGLE. TARGET ACQUISITION. LOW LEVEL INTELL ANALY
2	SIS. THIS IS A DIFFICULT TASK. THOUGHT IT IS A SKILL THAT NOBODY IN
3	THE ARMY HAS. OPTIMUM MIX OF PERSONNEL.
1	FO, TARGET MAN ON BMV(D)? 95 DELTA TO WATCH THE OTHER SCREEN, ACQUIRE
2	TARGETS, AND DO THE INTELL GATHERING; CROSSTRAIN THEM WITH THE FLYING
3	OPERATORS.
1	SHOULD BE TRAINED ON WHAT TO LOOK FOR AND HOW TO LOOK. COMMENT: THEY'

Line of Comment	COMMENT
2	RE NOT SEEING THE TARGETS.
1	NEED TO TRAINED TO DRL IN DIFFERENT ENVIRONMENTS; E.G., NTC, HEAVY FOL
2	IAGE, ETC.
1	IMAGERY SYSTEM IS OF CONCERN TO US BASED UPON THE VERY SMALL PERCENTAG
2	E OF STATIONARY TARGETS AND THE TECHNIQUE THAT THE BATTERY EMPLOYED DU
3	RING THE CONDUCT OF A RECONNAISSANCE MISSION, BE IT A POINT OR A GRID
4	SQUARE, OR WHAT NOT. GIVEN THE ARGUMENT OF OK, YOU'RE FLYING INTO AN
5	AREA AND YOU ARE AT 7-2 DEGREE ANGLE, WHAT IS YOUR DECISION POINT TO G
6	O TO THE 2.7 DEGREE ANGLE? WHAT RESEARCH DO THEY USE? WHAT METHOD DOE
7	S THE MSN COMM EMPLOY TO MAKE SURE HES FOUND EVERYTHING ON THAT GROUND
1	WE HAVE DISCUSSED THE METHODS OF DRL @ THE NOVICE LEVEL. WE'RE THE US
2	ER OF THE PRODUCT. IF THERE IS A PROBLEM OF TRAINING, THERE IS A PROB
3	LEM OF TRAINING NOT ONLY IN IMAGE INTERPRETING BUT IN METHODS OF IDENT
4	IFYING WHAT IS ON THE GROUND. WHAT DEGREE, ANGLE, DO YOU COME IN AT? W
5	HAT DEGREE IS THE CAMERA @? SHOULD YOU HAVE PARTICULAR METHODS IN THER
6	E OF WHEN TO SWITCH TO THE DIFFERENT FIELDS OF VIEW? SYSTEM DOES NO GO
7	OD IF IT CAN'T PROVIDE A PRODUCT.
1	IMAGERY QUALITY: SOME OF THAT MAY HAVE TO DO WITH THE PHYSICAL STRUCT
2	URE OF THE PAYLOAD. MAY NOT HAVE ENOUGH POWER OF THE RESOLUTION. MAYB
3	E THE VIDEO ITSELF. I'M CONCERNED ABOUT THE IMAGERY, PART OF IT MAY BE
4	FROM A NOVICE'S PERSPECTIVE IN HARDWARE.
1	VIDEO MONITOR: A 96D(IMAGE INTERPRETER) FROM INTELL FIELD MAY BE NEED
2	ED TO VIEW THE VIDEO, WOULD HAVE MORE EXPERTISE IN IMAGERY INTERPRETAT
3	ION; JUST TO FIND OUT WHETHER THERE IS A TARGET ON THE GROUND HE NEEDS
4	TO FOCUS ON.
1	ALMOST INVARIABLY THE DISCUSSION WOULD GO DOWN TO THE KEY PARTS OF THE
2	MISSION IN THAT WE HAVE TWO BMPS LOCATED AT GRID 1-2-7-4-5-6. SO WHAT!
3	THOSE TWO LINKED WITH TWO MORE, WHICH IS LINKED WITH TWO MORE; DO I HA
4	VE A MOTORIZED RIFLE BATTALION DUE IN HERE FROM GRID A TO GRID B? OK!
5	BY THE WAY DID YOU SEE THE REGIMENTAL COMMAND POST? DID YOU KNOW THAT
6	IT WAS 7-12 KILOMETERS BEHIND THAT LINE? DID YOU KNOW THAT IT'S WITHI
7	N ONE OF YOUR AREAS? THERE SEEMS TO BE A CONSTANT TUG-OF-WAR IN MY GUT
1	THAT YOU'VE GOT TO BRING THESE GUYS A LITTLE BIT OUT OF THE WEEKS HERE
2	THAT THEIR WORKING UNDERNEATH. ANY SAY, GUYS, YOU'VE GOT TO SIT THERE
3	AND MAKE SOME OF THESE DECISIONS ON YOUR OWN ON WHAT YOU'RE LOOKING FO
4	R. WHAT IS DOWN THERE AND HOW DOES A RELATE TO B?-RELATES TO C, WHICH
5	PAINTS A PICTURE. BECAUSE IF YOU CONTINOUSLY REPORT FIVE 5-TON TRUCKS
6	TO ME, FINE; I'M ALL FOR THAT, BUT I'M WORRIED ABOUT BIGGER THINS. AN
7	OVERALL UNDERSTANDING OF AIR/LAND BATTLE DOCTRINE AND WHAT THAT
1	SUPPORTED UNIT IS DOING AND ITS PURPOSE AND FUNCTION IN LIFE AND THE W
2	HOLE SCHEME OF MANUEVER THAT IT'S DEALING WITH AND THE FLOW OF THE COM
3	MANDERS INTENT. THE MISSION COMMANDER AND BATTERY COMMANDER HAVE GOT
4	TO APPRECIATE WHAT THAT DOCTRINE IS, IN ORDER TO PUT THEM IN A MIND SE
5	T AS FAR YOUR EXISTENCE OUT THERE AND HOW TO SUPPORT THAT OCCASION, IF
6	YOU WILL.
1	THEY WANT REMOTE VIDEO BUT MUST BE BETTER ON THE RESOLUTION. WE ARE GE
2	TTING A 60% OR 70% RESOLUTION ON WHAT IT IS.
1	MUST BE ABLE TO IDENTIFY THE TANK (T-64, T-72, ETC.), NOT JUST TO TYPE
2	IT.
1	MUST BE A HIGH RESOLUTION MONITOR? GARBAGE IN , GARBAGE OUT.

Target Identification MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	ALK OBSERVATION: CONTRAST AND SENSITIVITY ON OBSERVED MPO VIDEO DID
2	NOT SEEM TO BE ADJUSTED PROPERLY FOR MOST CONDITIONS. THE MPO HAS NO
3	ADJUSTMENTS FOR THIS ON THE CONSOLE. DETECTION AND IDENTIFICATION
4	MIGHT BE BETTER IF OPERATOR COULD ADJUST VIDEO TO PREVAILING LIGHT. IN
5	SOME SCEMES IT WAS NOT POSSIBLE TO DISCRIMINATE THE EDGE OF THE TARGET
6	FROM ITS SHADOW.
1	PAYLOAD-NEED BETTER RESOLUTION IN CAMERA. THERE'S TOO MUCH DISCREPANC
2	Y BETWEEN PAYLOADS.
1	MOP STATED THAT FOCUS WAS POOR IN THE 2-7 DEGREE FIELD OF VIEW AND THA
2	T HE WOULD LIKE A FOCUS CONTROL. THIS POINT WAS ALSO MADE BY MPO 2029
3	WHO FURTHER STATED THAT THE LACK OF FOCUS SEEMED TO BE WORSE NEAR THE
4	END OF THE TEST.
1	IF YOU FLY THE BIRD LOWER, THE PICTURE GETS BETTER; TRADEOFF ON SURVIV
2	ABILITY. THINK WE ARE USING THE RPV WRONG, STILL PLAYING FIRST LINE T
3	RACE. SECOND ECHELON PEOPLE NEED TO BE TRAINED TO LOOK FOR AND IDENTI
4	FY HIGH VALUE TARGETS. WE HAVE A DOCTRINE PROBLEM; WE ARE HEARING THA
5	T BRIGADE GOT TO BE CONCERNED ABOUT SECOND ECHELON; I'M NOT CONCERNED
6	ABOUT SECOND ECHELON; IM CONCERNED ABOUT KILLING THE FIRST ECHELON. S
7	ECOND ECHELON IS A DIVISION PROBLEM. CONCERNED ABOUT FLOT.
1	IT'S NICE FOR BRIGADE OR US TO HAVE A VIDEO MONITOR. WE CAN'T DO THAT
2	IN BATTLE. FIRST OF ALL, IT'S GOT TO GO DOWN; THE OTHER THING TO HAV
3	E IS A REQUIREMENT TO HAVE SIE INTERFACE; PUTS US RIGHT UP WHERE
4	WE'RE GOING TO GET OURSELVES SHOT AND WE'RE NOT GOING TO DO THAT. NEE
5	D SOMEONE WITHIN THAT SHELTER TO INTERPRET THAT IMAGERY. PROFESSIONAL
6	LY AND EXPERTLY SO WE CAN RELY ON THAT.
1	QUALITY OF THE IMAGERY NEEDS TO BE IMPROVED. THEY NOTED THAT THE QUAL
2	ITY VARIED QUITE A BIT.
1	OPERATOR CANNOT DETECT, RECOGNIZE, AND IDENTIFY TARGETS WITH PRESENT I
2	MAGERY.
1	THE CAMERA NEEDS TO BE IMPROVED. TV UPGRADE IS PARAMOUNT.
1	FLIR IS A WHOLE DIFFERENT WORLD OF IMAGERY INTERPRETATION.

Target Identification MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	MPO STATED THAT HE DID NOT, OR VERY SELDOM MADE ANY ADJUSTMENTS TO THE
2	CONTRAST AND BRIGHTNESS OF HIS VIDEO MONITOR DURING A FLIGHT. HE STA
3	TED HE SOMETIMES MADE ADJUSTMENTS JUST WHEN THE FLIGHT STARTED.
1	THE VIDEO ON THE MPO CONSOLE GETS OUT OF FOCUS WHEN YOU GO TO THE 2.7
2	DEGREE FOV.

Target Identification MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment COMMENT

THE QUALITY OF THE IMAGERY IS TOO POOR TO SPECIFICALLY IDENTIFY VEHICLES.

Artillery Mission MANPRINT*PRIMARY=TGT ACQ

Line of Comment COMMENT

DUE TO TEST CONDITIONS (NUMBER OF TARGETS, ETC.) IT MAKES IT HARD TO GIVE THE RPV A GOOD TEST, WHEN IT COMES TO ANALYZING WHAT THEY SAW OR NOT. ONE TIME WE SHOT AT A TENT AND A BMP (MAYBE IT WAS A COP, MAYBE NOT). THEY COULDN'T SEE ONE VEHICLE BUT THEY WOULD NORMALLY BE ABLE TO SEE A BATTALION . IN REAL SITUATION, THERE'S GOING TO BE ALOT OF THINGS GOING ON THE G-2 WILL PROBABLY RUN THE RPV UNDER THOSE CONDITIONS. WHEN IT GETS BACK, IT'LL BE WHAT HE IS ASKING FOR AND IT WILL

BE VERIFIED THROUGH US. HE'LL HAVE TO COME OVER AND GIVE US THE TYPE OF INTELL INFORMATION WE'RE LOOKING FOR. THAT'S THE REASON WE'VE GOT TO HAVE THE COMMANDERS (RPV) THERE TO KNOW WHAT'S GOING ON AND THE INFO THEY PROVIDE WILL LOOK GOOD TO US. WE NEVER DID SEE THAT OUT HERE DUE TO THE WAY THE TEST WAS SET UP; THE PEOPLE WEREN'T TRAINED TO DO THAT.

THE RPV WAS TESTED IN A PRISTINE ENVIRONMENT; IT WAS NOT STRESSED. REMOTE MONITOR IN TOC WOULD ELIMINATE A LOT OF THE CONVERSATION.

NEED A PERSON TO WATCH THAT MONITOR DURING FLIGHT. S-2 MAY NOT HAVE THE MANPOWER TO DEDICATE AT THAT TIME.

Artillery Mission MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment COMMENT

NEED TO BE A TRAINED FO BEFORE THEY START OUT. RPV CAN FIND TARGETS.

THE OBSERVERS WERE UNTRAINED. THE PERSONNEL CONDUCTING THE MISSION HAVE TO HAVE THE SAME TYPE OF TRAINING THAT THE FIST TEAM HAS IN ORDER TO GO THROUGH THE MECHANICS OF ADJUSTING FIRE QUICKLY, AND HAVE THE EXPERTISE ON THE BMV, BASIC UNDERSTANDING OF THE TACFIRE SYSTEM AS WE EXPECT FROM OUR FIST SYSTEM. OPERATOR NEEDS TO GO THROUGH BASIC FO TRAINING. WOULD BE MORE EFFICIENT AND RESPONSIVE. NEED BASIC FIST AND FO TRAINING.

FOUND SOME AREAS GOOD AND FOUND SOME FAULTS WITH THE BATTERY. TRAINING PERSPECTIVE: SOMEWHAT DISAPPOINTED TO RECEIVE A BATTERY WHICH HAD NOT BEEN ARTEPED, NOR HAD DEMONSTRATED TO ACCEPTABLE STANDARDS COMMON MILITARY FIELD SKILLS; ALTHOUGH IT HAD BEEN REPORTED THAT THE BATTERY HAD SPENT A CONSIDERABLE AMOUNT OF TIME IN THE FIELD AT FORT SILL, WHICH I'M SURE THEY DID.

HIS POINT IS CRITICAL IN TERMS OF HAVING A COMPETENT GROUP OF TRAINING

Artillery Mission MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
2	PEOPLE. MAYBE NOT TO GIVE YOU A FINISHED INTELLIGENCE PRODUCT BUT BE
3	ABLE TO GIVE YOU SOME DEGREE ON INTELLIGENCE PRODUCT THAT DEFINES TO A
4	DEGREE. IN THE ENVIRONMENT OF THE HQTS OF THE TAC THAT WOULD REQUIRE
5	THIS INFORMATION, NOT TE REGULATE THE RPV BATTERY TO A POSITION ON INS
6	IGNIFICANCE, BUT I WILL TELL YOU, IF YOU HAVE A COMBINED ARMS ARMY TO
7	YOUR FRONT AND YOU HAVE THREE MECHANIZED OR ARMORED BRIGADES THAT YOU
1	ARE DEFENDING OR ATTACKING WITH AND IF YOU'VE GOT REGIMENTAL COMMAND P
2	OSTS SEARCHING FOR YOU TO BRING IN ARTILLERY ON YOU AND YOU'VE GOT ALL
3	THESE OTHER THINGS GOING, IT JUST DOESN'T HAVE THE PRIORITY TO PUT 20
4	GUYS TO WORK IN THE DTAC OR SPEND HOURS TO FIGURE OUT THAT THE BRIGA
5	DE IS 20KS DOWN THE ROAD IS PASSABLE OR NOT. VERY QUICKLY BY SURVIVAL
6	AND BY THE NECESSITY IN TACTICAL SITUATIONS WHAT YOU END UP WITH IS T
7	HE RELEGATION OF THE RPV BATTERY TO (DID WE EVER GET THAT MISSION OFF
1	TODAY. DON'T WORRY ABOUT IT.) BECAUSE WE'RE FACING 4000 TANKS, AND G
2	OD KNOW WHAT ELSE, RIGHT THERE. AND WE DON'T HAVE THE TIME AND THE MA
3	NPOWERE BECAUSE WE'RE A VERY SMALL SELECT GROUP PUT OUT THERE BY OUR
4	LONESOME, WITH NOTHING TO SUPPORT US TO CONTROL THIS DIVISION. WE HAV
5	E TO RELY UPON EVERY INDIVIDUAL, EVERY SECTION. MY RPV BATTERY HAS TO
6	PRODUCE AS MUCH OF A FINAL PROFESSIONAL PRODUCT FOR THE END SOLUTION A
7	S WE CAN. (CONTINUED UNDER 0190)
1	HE (RPV) CAN'T TAKE RAW DATA AND CONVERT IT. BY THAT POINT, TIME IS G
2	OING TO BE THE END POINT. WE MAY HAVE ALREADY PASSED THE OBJECTIVE OF
3	THE TIME HE (RPV) CAN CONVERT IT INTO SOME KIND OF INTELLIGENCE.
1	TARGET ADJUST: WE NEED MORE DEPTH IN TRAINING ON THE DMD AND VOICE CA
2	LLS FOR FIRE.

Artillery Mission MANPRINT*PRIMARY=MANPWR & PRSNNL

Line of Comment	COMMENT
1	NEED TO LOOK AT WHAT CHANGES ARE REQUIRED IN STAFFING THE BRIGADE S-2
2	SECTION. THE MONITOR ON THE TOC NEEDS TO HAVE THE SAME TRAINING AS TH
3	E PERSONNEL IN THE GCS.

Artillery Mission MANPRINT*PRIMARY=COMM

Line of Comment COMMENT

COMMO: GE 254 AND LONG RANGE ANTENNAS WERE USED. NUMBER OF RADIOS IMPACTED MORE ON COMMO PROBLEMS AT LR ANTENNA. DIDN'T HAVE ENOUGH. THEY. HAD THREE IN THE GCS; THEY HAD A FIRE MISSION NET, FLIGHT OPS NET, BATTERY COMMAND LOW POWER, AND BATTERY COMMAND MEDIUM POWER, WRONG TEAM--IT WAS???THREE BTR 46 FIXED RADIOS, WAY THEY WERE USING THE NETS. CAME OUT OF THE SD, HAD THREE BTR 46 RADIOS, CAN SET ALL OF THEM ON HIGH POWER. FOR THE CLRS TO TALK TO ME AND TALK TO THE SDS AND TO TALK TO THE BATTERY COMMANDER, IT WAS IMPOSSIBLE. NO ONE WAS BEING TALKED TO. WHEN THEY WERE MOVING THEY WEREN'T TALKING TO ME. WHEN THEY WERE SET UP AND FLYING DUAL MISSIONS, THEY WEREN'T TALKING TO THE BATTERY COMMANDER. AND WHEN THE CLRS WAS ALLOCATED TO FLY A DIVARTY MISSION, THEY HAD TO DROP DOWN, TO DIVARTY COMMAND, FIRE STILL HAD CONTROL OF THEM, TECHNICALLY. WE NEVER HEARD ANYTHING THAT WENT ON FROM THEM UNTIL IT WAS OVER. IT WAS JUST AN INSUFFICIENT AMOUNT. THERE IS AN INTELL NET REPORTING. IN A REAL WORLD SITUATION THE RADIO TRAFFIC INCREASES. IT WAS ALL WELL AND GOOD WHEN IT WAS JUST THE RPV BATTERY AND DTAC. THERE WILL BE TOO MUCH TRAFFIC ON THAT ONE ITNELL NET. YOU'RE NOT GOING TO HAVE TIME TO SIT DOWN WITH THE RPV BATTERY AND THE AVS IN THE AID AND GLEEN THE INFO THAT COMES OFF THE INTELL NET. IT'S GOING TO BE A BUSY NET. RECOMMEND: HAVE SOMEONE IN THAT FORWARD TOC (THAT'S HIS PLACE OF DUTY). (CONTINUED ON 0194)

MI BN L&O WITH HIS OWN VEHICLE AND RADIO AND WORKING WITH HIMSELF AND THE RPV BATTERY ON AN INTERNAL NET. HE WILL BE OUR GO BETWEEN FOR MISSION ORDERS, ANY COMMUNCATIONS THAT WOULD BE REQUIRED. RIGHT NOW, IT'S NOT PART OF THE TO&E.

TARGET ADJUST: CONVENTIAL ROUNDS, WE GIVE LEFT TO RIGHT, UP-DOWN, AND ADD-DROP. ITS ON THE SCREEN SO ITS HARD TO MAKE MISTAKES. YOU GIVE DIRECTION WHEN YOU GIVE TARGET LOCATION.

Artillery Mission MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment COMMENT

INSTEAD OF JOYSTICK-USE A TRACK BALL. GET RANGE TO SHOW UP IN AUTO SEARCH. LASER BUTTON COULD BE BETTER.

Artillery Mission   MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	WHO IS ASSIGNED THE RPV (ARTILLERY/INTELLIGENCE) DETERMINES TO A LARGE
2	PART WHAT MOS'S SHOULD BE ASSIGNED TO IT. FROM MY POINT OF VIEW IT SH
3	OULD BE A 96D (IMAGE INTERPRETER) WHO CAN TELL WHAT HE'S SEEING WHEN H
4	E SEES IT AND CAN PROVIDE AN ACCURATE DESCRIPTION OF IT. MAY WANT TO
5	USE MI W/ARTILLERY SO THE CROSSTRAINING WOULD BE ENCHANCED.GCS & FCS P
6	ERSONNEL AREN'T REQUIRED TO DO ANY MORE THAN WHAT THE ARMY WANTS EVERY
7	INFANTRYMAN TO DO. THE GCS'S SKILLS ARE A COMMON SKILLS TASK.
1	IT WAS NOT AS DIFFICULT OUT THERE AS IT'S BEEN PORTRAYED. THEY HAVE T
2	O LEARN OTHER TECHNICAL THINGS, I'M SURE. IF PUSH COMES TO SHOVE.
3	SHOULD TAKE ARTILLERYMEN AND TEACH THEM THE MI SKILL, OR TAKE THE MI P
4	ERSON AND TEACH HIM THE ARTILLERY SKILLS. IT'S MUCH EASIER TO TAKE MI
5	AND TEACH THEM FIELD ARTILLERY SKILLS. FA SKILLS NEEDED TO DO THE JOB
6	ARE MUCH LESS.
1	THERE WAS A BREAKDOWN IN PROCEDUREAL DISCIPLINE WHICH WAS CONDUCT
2	OF THE TEST. THIS HAS CAUSED WELL DOCUMENTED CONCERNS AT THE FIELD AR
3	TILLERY SCHOOL, AND A TIME ELEMENT IN THE RECORD TEST OF THE RETRAININ
4	G OF THE BATTERY ITSELF.
1	WHAT CONCERNS ME IS THAT THE BREAKDOWN OCCURRED AT A VERY HIGH LEVEL W
2	ITHIN THE CONSTRUCT OF THE BATTERY. THAT WAS AT THE WARRANT OFFICER L
3	EVEL, THE REAL TECHNICIANS.
1	YOU'RE SAYING THAT THE CLRS SHOULD FLY THE CLOSE-IN MISSION AND THE FC
2	S SHOULD FLY THE FAR-OUT MISSION. IN AIR/LAND BATTLE DOCTRINE WE NEED
3	TO GO OUT, WE GOT .BRIGADE TO THINK THAT WE'RE FIGHTING THIS F
4	RONT ECHELONS HERE AND PLAN OUR NEXT MISSIN AND WHAT WE'RE GOING TO DO
5	NEXT WEEK, AND LOOK FURTHER OUT . WE COULDN'T GET OFF THE PO
6	ST IN THIS EXERCISE; IT MIGHT BE DIFFERENT IN AN ACTUAL SITUATION. IN
7	REAL LIFE USAGE IT'S TOTALLY UNACCEPTABLE, BECAUSE IT'S JUST NOT GOING
1	TO WORK. CAVEAT: IF THEY HAD THE OTHER ELEMENTS, THE BOC, OR ANOTHER
2	SET OF CLRS, ONE WE GET THERE SITTING CLEAR BACK HERE WITH DIVARTY, W
3	HO IS ANOTHER 10 KILOMETERS OR SO BACK FROM US, AND THEY'RE SUPPOSED T
4	O BE CONTROLLING THE FIRE WAY OUT HERE. ON THINGS WE SEE, IT ISN'T GO
5	ING TO HAPPEN. AN UNWORKABLE SYSTEM.
1	BOC: IS A NONFUNCTION ENTITY AS A RESULT OF OUR EXPERIENCE. SOMEHOW
2	HE'S GOT TO ORCHESTRATE THE MANAGEMENT AND LEADSERHIP, THE COMMAND AND
3	CONTROL OF ALL OF HIS ELEMENTS THAT THOSE COMMANDERS ARE USING TO FIGH
4	T. YOU'VE GOT THREE FCS'S, TWO CLRS'S AND A BOC. WHAT IS HIS FUNCTIO
5	N IN LINE? IT HAS NOT BEEN ADEQUATELY ADDRESSED. UNLESS I CALLED FOR
6	THE BATTERY COMMANDER, HE NEVER COMES UP ON THE NET. NEVER ONCE CHALL
7	ENGED ME ABOUT ANYTHING DEALING WITH HIS PEOPLE OR MAYBE THE MISSION
1	ORDER THAT I SCREWED UP ON. SEEMED A REMOTE PART OF THE TEAM.
1	BOC: IN A TACTICAL ENVIRONMENT HE HAD NO FUNCTION TO PERFORM. DURING
2	THE TEST IT WAS MAINLY ADMINISTRATIVE. FROM THE DIVISION TAC PERSPEC
3	TIVE HE DIDN'T HAVE A FUNCTION TO PERFORM ON A DAY-TO-DAY BASIS. IT W
4	AS NOT OBSERVABLE TO ME IF HE DID. HE IS THE LIAISON AND HE NEEDS TO
5	BE THERE TO RELAY ORDERS, ETC. IF WE GO TO THE REAR HE'S BACK WITH DI
6	VARTY OR BACK WITH THE MAIN; NEEDS TO BE UP WITH THE DTAC. NEEDS ADDI
7	TIONAL RADIOS TO SUPPORT THIS CONCEPT. NEEDS TWO NETS, AT LEAST, AND
1	PROBABLY THREE. NEEDS TO TALK TO FCS'S. CAN BE WIRED INTO US AND ABL
2	E TO CONTROL HIS ELEMENTS AND DO WHAT A COMMANDER IS SUPPOSED TO DO; I
3	.E., GOING TO BRIEFS, RECEIVING ORDERS, KNOWING WHAT THE SCOPE OF THE

Line of Comment	COMMENT
4	BATTLE IS, AND RELAYING THIS TO HIS FCS'S. IT HASN'T BEEN SET UP THAT
5	WAY.
1	THE COMMANDER AND HE WAS NOT FULLY ALLOWED TO DO HIS JOB BECAUSE HE WA
2	S DOING A PART OF SOME ELSE'S JOB. UPON RECOVERY OF THE AV, THE WARRA
3	NT OFFICER DOESN'T NEED TO BE THERE. WE WOULD WANT THE MISSION COMMAN
4	DER TO UP AND HE WOULD WANT TO STAY AND BE THE TECHNICIAN.
1	DURING NTC I MADE 90% OF THE COMMANDER'S DECISIONS AS MISSION COMMANDE
2	R AND STILL FLEW. CAN'T DO THAT IN A REAL LIFE SITUATION. WE HAVE HE
3	RE AN OPERATIONAL MISMATCH. WHEN THE FLIRS COME IN, THERE IS A 24-HOU
4	R OPERATION REQUIREMENT. CAN COUNT HOTSPOTS AND SIZE OF SIGNATURE CAN
5	GIVE AWAY TYPE OF TARGET.
1	TARGET ENGAGEMENT: I WATCH FOR RANGE AND GRID. I CAN TELL IF THE LAS
2	ER IS BEING FIRED FROM MY SCREEN. I TELL MPO GET ON TARGET, LASE, GET
3	GRID AND GO TO BURST MODE.
1	TRACK ADJUST: NO PROBLEM UNLESS ITS OUT OF FOV. MAKE SURE WE~RE IN
2	20 DEGREE FOV.
1	TARGET ADJUST: WE LASE ON THE BURST, FOR MULTIPLE ROUNDS WE USE CENTE
2	R OF MASS.
1	ARTILLERY ADJUST: WE USE THE 20 DEGREE FIELD OF VIEW SO WE CAN SEE IF
2	ROUNDS MISS.
1	WE CAN TARGET TO CHANGE THE LASER WHEN ADJUSTING FIRE FOR CONVENTIAL R
2	OUNDS.
1	ARTILLERY ADJUST: I MAKE SURE MPO IS IN BURST IF ITS A CONVENTIAL ROU
2	ND. MPO FIRES LASER FIRST TO GET GRID AND ALTITUDE. MUST BE SURE LAS
3	ER IS ARMED.
1	ARTILLERY ADJUST: SOMETIMES WE HAVEN'T GONE TO BURST RIGHT AWAY FOR A
2	DJUST OR FORGOT TO FIRE LASER.
1	TARGET ADJUST: IF TEH SMOKE BLOWS AWAY FAST YOU MIGHT MISS THE CENTER
2	OF MASS. THERE ARE LOTS OF CRATERS IN THE IMPACT AREA.
1	WHAT DO I HAVE THE CAPABILITY TO INFLUENCE; THAT~S WHAT I WANT TO FLY
2	FIRST. THE CAPABILITY OF THE BRIGADE HAS TO INFLUENCE THAT AREA. ARE
3	AS OF INTEREST COME SECOND. AREAS OF INTEREST OFTEN FALLS IN THE AREA
4	OF DIVISION PERSPECTIVE; LOOK OUT FURTHER HERE, IT MAY AFFECT YOU. T
5	HAT'S WHERE THEY REALLY COME IN.
1	DID NOT TEST. WHAT HAPPENS IF THE FCS IS FLYING SOMEONE ELSE'S MISSION
2	. HOW DOES THE MANEUVER UNIT GET INVOLVED WITH THAT? CORPS MAY NOT BE
3	ABLE TO COMMUNICATE WITH THEIR FCS. (I ASSUME THAT CORPS IS USING DI
4	VISION ASSETS.) INTERACTIONS BETWEEN CORPS AND DIVISION RPVS.
1	WOULD PROFIT BY HAVING WHAT A RESPONSIVE FIRING UNIT CAN DO FOR YOU.
2	IF YOU'RE PROVIDING THE INPUT TO THE FIRING UNIT. WOULD SPEED UP THE
3	FIRING.
1	HOW IS THE RPV GOING TO FIT INTO THE ORDER FORMAT? WHEN GIVING OP ORD
2	ERS, HOW DOES THE RPV FIT INTO THE NORMAL ORDER PROCESS? WHEN I'M ISS
3	UING OP ORDERS TO THE BATTALIONS OF PART OF THE BRIGADE?
1	ISSUING THE OP ORDERS FOR THE OT WAS DONE IN A STERILE ENVIRONMENT. H
2	OW WILL IT SURVIVE THE REAL WORLD TEST OF TRYING TO INTEGRATE IT WITH
3	THE REAL OP ORDER?
1	MAY BOIL DOWN TO 3 OR 4 SENTENCES IN THE MANEUVER OP ORDER. QUESTIONI
2	NG TIME TO DO IT, FORMAT, ETC. NOT SURE WHAT IT COULD BE LIKE IN A BA
3	TTLE ENVIRONMENT.

Artillery Mission MANPRINT*PRIMARY=OPER PROC

Line of Comment	COMMENT
1	PROBABLY WOULD BE AN ANNEX TO THE OP ORDER. THEN ISSUE FRAG ORDERS.
1	DIVISION WOULD GIVE ABOUT 24 HOURS LEAD TIME; YOU'LL HAVE THESE SORTIE
2	S, BEGIN PLANNING WITH; START PREPLANNING WITH THE G-2.
1	NEED TO HAVE A CHANCE TO INTEGRATE RPV INTO A REAL TIME SCENARIO. -MAY
2	VERY WELL FALL INTO PLACE. DIDN'T TEST RPV WITH ANYTHING ELSE. NO P
3	ROBLEM WITH THE FORMAT. DON'T KNOW WHERE IT FITS IN WITH THE REAL FIG
4	HT. DIDN'T WORRY ABOUT MANEUVERING THREE BATTALIONS, ARTILLERY, ETC.
1	RPV NEEDS TO KNOW THE WHOLE ENVIRONMENT IT'S OPERATING IN. GIVE THEM
2	THE WHOLE OP ORDER. SHOULD BE PART OF THE ORDERS BRIEF. NEEDS TO BE
3	TRIED TO WORK OUT THE PROCEDURES BEFORE IT BECOMES DOCTRINE.
1	DETERMINE TARGET: SOME TARGETS COME IN MISSION ORDER, LIKE TAKEOUT TH
2	E LEAK TANK, OR HIT ANY TARGET OF OPPORTUNITY. SOMETIMES I DECIDE IF
3	THE TARGET SHOULD BE HIT.
1	TARGET ADJUST: MPOS FORGET TO GO TO BURST MODE TO GET ROUND IMPACT. M
2	POS HAVE GONE BACK TO TARGET MODE.
1	YOU ARE FACING HERE THE DIVISION TACTICAL COMMAND. ALL THE ELEMENTS.
2	OUR PERSPECTIVE IS FIRST OF ALL FROM THE DIVISION COMMAND AND CONTROL,
3	FOCUS OF A HEAVY ARMORED DIVISION WITH THE AIR/LAND BATTLE DOCTRINE OF
4	HOW WE FIGHT ABND INTEND TO FIGHT FROM THAT DOCTRINAL FOCUS.

Task=3 MANPRINT*PRIMARY=TGT ACQ

Line of Comment	COMMENT
1	MPO STATED THAT HE WAS SEVERAL WEEKS INTO THE TEST BEFORE HE LEARNED T
2	O REOGNIZE CAMOUFLAGE AND LEARNED HOW TO LOOK FOR TARGETS IN GENERAL.

Task=3 MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	TM DEP. 55-1550-200-10-2 TASK 2-17 PAGE 2-612 EXHIBIT 1. TERMS SUCH AS
2	RATE STEP, FRAMES PER SECOND, RESOLUTION, & TRUNCATION RATIO MEAN NO
3	THING TO THE OPERATOR. IT APPEARS THAT AJ0-AJ6 CARRIES WITH IT A RATE
4	STEP OF GOOD, BETTER, OR BEST.

Task=3 MANPRINT*PRIMARY=CREW STATN DSGN

Line of Comment — COMMENT

1 TM DEP. 55-1550-200-10-2 TASK 2-21 SHOULD BE INCLUDED IN TASK 2-17.
2 THEN TASK 2-21 CAN BE ELIMINATED. FOV SELECTION SHOULD BE SEQUENTIAL
3 AND CONTROLLED BY A DEFAULT LOOP, THE OPERATOR SHOULD NOT BE ABLE TO G
4 O TO 2.7 DEGREES FOV FROM ANY OTHER FOV EXCEPT 2.7 DEGREE. FOV DEFAUL
5 T SHOULD BE 20 DEGREE, PRESS THE SAME BUTTON FOR 7.2, PRESS THE SAME
6 BUTTON FOR 2.7. IF THE SAME BUTTON IS PRESSED AGAIN THE FOV RETURNS T
7 O 20. THIS ACTION WOULD REDUCE # OF BUTTONS THAT OPERATOR NEEDS.

Task=3 MANPRINT*PRIMARY=CNTRLS & DSPLYS

Line of Comment — COMMENT

1 VIDEO DISPLAY SCOPES: VIDEO QUALITY APPEARS TO BE A FUNCTION OF ANTI-
2 JAM. ANTI-JAM PROFICIENCY SHOULD BE INDICATED ELSEWHERE. ANY DISRUPT
3 ION OF THE VIDEO DISPLAY INCLUDING VIDEO THAT IS ACHIEVED OR DERIVED I
4 S A PAIN FOR THE OPERATOR.
1 VIDEO DISPLAY SCOPES: FOR ANY GIVEN VIDEO DISPLAY IN THE GCS, THE PIC
2 TURE SHOULD BE HELD CONSTANT WHILE THE OPERATOR MOVES THE CURSOR ABOUT
3 . AS THE OPERATOR MOVES THE EDGE OF THE SCREEN THE COMPUTER WOULD MOV
4 E A NEW SECTION OF VIDEO INTO VIEW AND RECENTER THE VIDEO ON THE SCREE
5 N. IT IS MUCH EASIER ON THE OPERATOR TO VIEW A CONSTANT SCREEN. CURR
6 ENTLY THE OPERATORS USE A RANDOM MOTION TO SCAN THE SCREEN AND AT THE
7 SAME TIME THE VIDEO IS BEING PLACED ON THE SCREEN IN A RANDOM PATTERN.

Task=3 MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment — COMMENT

1 TM: DEP. 55-1550-200-10-2 TASK 2-21 AUTO SEARCH MUST BE A FUNCTION OF
2 AV HEADING AND SPEED. THE DOWN LOOK ANGLE SHOULD HAVE A DEFAULT VALUE
3 (MIN & MAX). ONCE EITHER VALUE IS REACHED, THE PROCESS IS REPEATED.
4 THE SPEED OF SEARCH (PAYLOAD) MUST BE OPERATOR CONTROLLED BUT THERE MU
5 ST BE A DEFAULT VALUE (MAX) THIS WILL ELIMINATE THE PROCESS OF DETERMI
6 NING SEARCH CORNER POINTS.

Task=4 MANPRINT*PRIMARY=EQUIP DESIGN

Line of Comment	COMMENT
1	DEP 55-1550-200-10-3 TASK 2-58: LARGE AND SMALL EMERGENCY HYDRAULIC H
2	OSES DO NOT HAVE A MEANS TO TRAP OIL UNDER PRESSURE. THESE ARE NOT QU
3	ICK DISCONNECT HOSES. OIL IS LOST WHILE MAKING OR BREAKING THESE CONNE
4	CTIONS AND IT COVERS THE OPERATOR'S HANDS, FACE, AND OTHER PARTS OF HI
5	S BODY. CONNECTION IS MADE WHILE THE OPERATOR IS LYING ON HIS BACK UN
6	DER THE VEHICLE.

Task=Other
MANPRINT*PRIMARY=TRNG & TRNG AIDS

Line of Comment	COMMENT
1	A GOOD LOOK AT TRAINING IS GOING TO BE REQUIRED.
1	TRAINING AIDS SHOULD BE DEVELOPED TAILORED TO THE RPV OPERATORS (CONTR
2	OL STATIONS). WILL NEED AIDS TO TRAIN AND SUSTAIN. TRAINING SUPPORT
3	IS IMPORTANT.
1	NEED TO HAVE THE TIME DEVOTED TO TRAINING R & I:
1	NEEDS TO HAVE A CAREER PROGRESSION.
1	WITH THE PROPER TRAINING THE RPV CAN BE INTEGRATED INTO THE SCHEME OF
2	MANEUVER, ETC.
1	RETRAINING TOOK PLACE DURING THE CONDUCT OF THE RECORD TEST BY THE FIE
2	LD ARTILLERY SCHOOL ON THE EMPLOYMENT OF CORRECT "CALL FOR FIRE" PROCE
3	DURES, AFFECTING EITHER THE 6400 MIL OR AFFECTING EITHER OT LINE, OR A
4	NGLE OF & HAVING LISTENED TO THE CALL FOR FIRE MSNS THAT WERE M
5	ONITORED OVER THE O & I NETS, SIMPLE THINGS THAT YOUR BASIC 11 BRAVO I
6	NFANTRYMAN UNDERSTANDS OF FLASH AND BANG WERE NOT USED.
1	OPERATIONS AND STAFF PERSPECTIVE: SOMEWHAT AGGRAVATED WITH THE LEADER
2	SHIP TRAINING AND THE GENERAL SKILLS KNOWLEDGE OF AIR/LADN BATTLE DOCT
3	RINE AND HOW THAT APPLIES TO A HEAVY ARMOR DIVISIN AND HOW WE FIGHT; S
4	EEMED TO BE A LACK OF KNOWLEDGE IN AIR/LAND BATTLE DOCTRINE AT THE BAT
5	TERY. NOT TALKING ABOUT THE PFC, IT WAS THE MISSION COMMANDERS, BATTE
6	RY COMMANDERS.
1	EVERYTIME THAT WE TRIED TO HAVE OPE SESSION WITH THE FOLKS TO TRY AND
2	GET THEM TO FOCUS ON THE BIG PICTURE, I.E., YOU'VE GOT TO UNDERSTAND W
3	HAT THE DIVISIONIS DOING; WHAT THE COMMANDER'S INTENT OF THE HEAVY ARM
4	OR DIVISION IS; WHAT THE BRIGADE COMMANDER'S INTENT IS; AND HOW DOES H
5	E INTEND TO WORK THIS PIECE OF THE BATTLE RIGHT HERE. YOU'VE GOT TO U
6	NDERSTAND THE 10-20 METHODS YOU'VE GOT ON YOUR MISSION ORDER.
1	REASON WAS THE LACK OF LEADERSHIP TRAINING. (QUESTION: MAYBE THEY DID
2	N'T UNDERSTAND THE NEED?) I THINK THAT IS A VALID COMMENT, BUT I ALSO
3	WILL TELL YOU THAT WHEN I TELL A CW2 FACE TO FACE, "I EXPECT YOU HERE"
4	, THAT IS A STANDING ORDER, AS FAR AS I AM CONCERNED. FROM THE DIVISI
5	N COMMANDER IT WAS FAILED TO BE FOLLOWED.

MANPRINT*PRIMARY=SAFETY & HLTH HZRDS
Task=Other

Line of Comment	COMMENT
1	SAFETY- WHILE SHUTTLE OF AV WAS BEING POSITIONED ON LV OPERATOR CLIMBI
2	NG LADDER (WITHOUT HAND RAIL) USED PART OF SHUTTLE FRAME AS HAND HOLD
3	WHEN SHUTLE WAS PUSHED IN PLACE HIS INDEX FINGER WAS MASHED
1	RADIO AND RPV NOISE LEVELS TOO HIGH. INTERFERS WITH COMMO. CAN'T TAL
2	K OR HEAR WHERE USING COMMO EQUIPMENT.
1	NOISE LEVELS ARE TOO HIGH-RADIO NOISE, RPV ENGINE NOISE-DAMAGES HEARIN
2	G, INTERFERES WITH COMMO. IT DIFFICULT TO COMMUNICATE.
1	NOISE BEHIND LV IS TERRIBLE. TOO MANY RADIOS.
1	AV-LV COMMO PROBLEMS TOO NOISY.
1	SAFTEY: METHELELETHELKEYSTONE IS VOLITILE AND HAZARDOUS TO BREATHE
2	THE FUMES. NO SAFE STORAGE PLACE IN SHELTHER.
1	VENTILATION IN THE MAINTENANCE SHELTER IS VERY POOR. WE CAN'T GET RID
2	OF FUMES.
1	CRANE, MS: THE CRANE DOES NOT REMAIN LEVEL AND BINDS UP. OPERATES IN A
2	JERKY FASHION. BOUNCES AV. MAY CAUSE EQUIPMENT DAMAGE
1	MOISTURE MAKES THE AV PARACHUTE EXPAND. WILL WE HAVE TO REUSE THESE P
2	ARACHUTES IN COMBAT? WE WILL NEVER GET THESE CHUTES REPACKED.
1	STATIC ELECTRICITY COULD CAUSE THE AV PARACHUTE TO ACCIDENTALLY DEPLOY
2	. THE LITTLE GROUND, SHORTING DEVICE WE STICK IN THE CHUTE DOOR GETS
3	LOST AND OFTEN ISN'T USED. THE CHUTE DOOR COULD BLOW OPEN WHILE WE AR
4	E HANDLING THE AV.
1	THERE IS NO SAFE STOWAGE LOCATION IN THE MAINTENANCE SHELTER FOR METHL
2	ETHL KETONE.

MANPRINT*PRIMARY=MANPWR & PRSNNL
Task=Other

Line of Comment	COMMENT
1	THE ADDITION OF FLIR WOULD INCREASE THE MANPOWER REQUIREMENTS. WITH D
2	AYLIGHT OPERATIONS THE RPV CAN OPERATE FOR APPROXIMATELY EIGHT HOURS.
1	OPERATING 24 HOURS A DAY, SEVEN DAYS A WEEK, IT'S HARD TO DETERMINE WH
2	AT NEEDS TO BE DONE UNDER THESE CONDITIONS.
1	WHAT IS THE MOS GOING TO BE FOR A MISSION COMMANDER? NOW, THEY ARE RA
2	DIO TECHS. DON'T HAVE E-7S OR WARRANTS TRAINED TO BE ABLE TO WORK WIT
3	H BRIGADE AND THINK ABOUT WHAT THE S-2 IS PLANNING. NEEDS TO BE PART
4	OF THE COMBAT GROUP. MUST UNDERSTAND THE TOTAL FLOW OF THE BATTLE. M
5	UST UNDERSTAND THE WHOLE SCHEME OF THE BATTLE.
1	RADIO TECHS ARE NOT TRAINED TO BE PART OF THE COMMANDER'S STAFF.
1	WE DON'T HAVE ENOUGH MEN FOR PERIMETER OR SITE SECURITY. P.C.S IN THE
2	AREA HAVE ALMOST CUT OUR COM WIRES. THE AMBULANCE RAN OVER THE FO CA
3	BLES. THERE IS NO ONE TO CONTROL UNEXPECTED TRAFFIC.
1	MOPP MS: NO NBC DETECTOR IN SHELTER
1	CLRS: WE USE MAN OPTION, FOR FIRE AND HASTY MISSION. THE FORTH MAN
2	TAKES THE BURDEN OF THE RADIOS. THE FORTH MAN IS RTO. THREE RADIO MODE
3	L 524 IN MOUNT VRC 46
1	CLRS: MC IT'S UNREALISTIC TO EXPECT MC TO SUPERVISE THE TWO OTHER
2	OPERATORS. MY MAJOR FOCUS HAS TO BE ON THE NDV AND DMD. IT'S TOUGH

MANPRINT*PRIMARY=MANPWR & PRSNNL
Task=Other

Line of Comment	COMMENT
3	TO WATCH THE SCREEN

MANPRINT*PRIMARY=CREW STATN DSGN
Task=Other

Line of Comment	COMMENT
1	FCS: NOT ENOUGH ROOM FOR MOVEMENT BEHIND AVO. COM. CABLES ARE CONSTAN
2	TLY BUMPERED. ORIENTATION OF RADIOS STACKING NOT PLANNED WELL.
3	STRAIGHT OUT POWER SUPPLY PLUG AT BOTTOM OF COMM. (NEAR FLOOR, LEFT
4	SIDE) COULD BE BROKEN BY STEPPING ON IT. RIGHT ANGLE PLUG WOULD
5	PARTIALLY CORRECT
1	FCS: LINES TO EARPHONES AND MIKE HANGS IN FRONT OF CONSOLE OBSCURES VI
2	SION. POSITION OF MIKE PLUG NOT OPTIMUM FOR OPERATIOR CREATES INTERFER
3	ENCE FOR PERFORMING ROUTINE TASKS
1	FCS: BIGGEST PROBLEM COMMO CABLES NEED IDENTIFYING TAGS WHICH CABLE G
2	OES TO WHICH UNIT-P2-J2, ETC. NEED HF DOCUMENTATION CATEGORY. INCONSIS
3	TANT NUMBERING SYSTEM USED IN SCHEMATICS AND HOOK UP DIAGRAMS CREATE C
4	ONFUSION IN HOOK UP AND POSSIBLE CROSS WIRING
1	GCS: MPO HAS TO CROSS ARMS TO USE LASER. CAN'T MOVE BETWEEN PEOPLE AN
2	D THE COMMO RACK; MET UPDATES HARD TO GET AND MUST RECEIVE IN COMPUTER
3	FORMAT. GDT PANEL, LINK LIGHTS TOO HIGH; SOMETHING IN THE POWER SUPP
4	LIES BURNS OUT RADIOS; MAY NEED TO MOVE TELEPRINTER; USE ROLL INHIBIT;
5	WHEN IN A MANEUVER AND LASER IS LOCKED ON A TARGET.
1	GCS: NEEDS MORE STORAGE SPACE INSIDE; AVO GDT DISPLAY HARD TO SEE; NOT
2	ENOUGH ROOM IN GCS WHEN WEARING LBE; DMD BUTTONS TOO SMALL WHEN IN MO
3	PP; GCS CIRCUIT BREAKERS SHOULD BE IN ONE BOX AT REAR DOOR; LOST LINK
4	DATA IS DEFICIENT; LASER BUTTON NOT MADE FOR RIGHT-HANDED OPERATORS;
5	IF USING RADIOS, INTERCOM INTERFERES WITH RADIO MESSAGES. DIFFICULT T
6	O ACCESS TELEPRINTER KEYBOARD. WE USE ROLL INHIBIT WHEN LOCKED ON A T
7	ARGET.
1	GCS: INTERIOR NEEDS REARRANGING; NEED MORE SPACE FOR STORAGE AND WORKI
2	NG. NEED TO LOWER GDT PANEL. CHANGE LOST LINK AND TRANSMITTER CONTRO
3	LS ON AVO CONSOLE. TOO MANY RADIOS TO MANY INTERRUPTIONS-COMMO RACK T
4	OO LARGE. MUST BEND OVER-NOT ENOUGH LEG ROOM UNDER TELEPRINTER.
1	GCS: SPACE INADEQUATE; MOVE LASER FIRE BUTTON TO LEFT. CABLES NEED TO
2	BE MOVED OUT OF AISLES IN GCS. MOVE COMMO RACK-USE SMALLER COMPONENT
3	S INSIDE.
1	GCS: NOT ENOUGH ROOM; RGT MIM PANEL HARD TO SEE WHEN STANDING UP. NOI
2	SE LEVEL IS HIGH. GCS SWITCHES WEAR OUT TOO FAST. FM RADOS ARE WIRED
3	WRONG-BLOW OUT. MPO NEEDS ACCURATE GRIDS FOR SEARCH AND RANGE. MOVE
4	LASER SWITCH.
1	GCS: NEEDS MORE SPACE. EMERGENCY PROCEDURES NEED TO BE EXPANDED. AVO
2	CONSOLE IS LOCATED TOO CLOSE TO COMMO RACK. Q LOST LINK SHOULD BE BE
3	LOW THE SCREEN. I MISS THE ALTITUDE UNLESS I LOOK VERY CLOSELY. NOIS
4	E LEVELS INSIDE ARE TOO HIGH. FM RADIO LOCATION IS BAD; TELEPRINGTER
5	NEEDS A CRT INSTEAD SO YOU CAN SEE THE LINE THAT'S BEING TYPED.
1	AUTO SEARCH MODE TAKES YOU THROUGH TREE LINES AND PLACES YOU DON'T NEE

MANPRINT*PRIMARY=CREW STATN DSGN
Task=Other

Line of Comment	COMMENT
2	D TO SEARCH. GCS-MOVE LASER FIRE BUTTON; TO MUCH NOISE INSIDE GCS; HE
3	ADPHONES COULD BE BETTER.
1	WORKSPACE, MS: LITTLE ROOM WHEN AV IS IN CRADLE
1	THE SPACE IN THE MAINTENANCE SHELTER IS TOO CONFINED WHEN AN AV IS ON
2	THE STAND.
1	FCS: AVO NEEDS TO STAND FREQUENTLY AND REACH TO REBOOT COMPUTER.
2	ESSENTIAL TASK OUT OF NORMAL WORK FLOW AREA.
1	FCS: BLACK OUT CONFIG- NO LIGHT- NO PROVISION FOR ANY LIGHT INSIDE FC
2	S IN BLACK OUT CONDITION WHEN DOOR IS OPENED
1	FCS: TAILGATE WAS MUCH HEAVIER THAN NECESSARY. DIFFICULT TO LIFT FOR
2	ONE MAN WHEN PREPARING FOR TRANSPORT
1	RECOVERY - BRAKE TEMP. GUAGE RECESSED AND DIFFICULT TO READ OR GET ACC
2	ESS TO TEST BUTTON
1	MAINTENANCE SHELTER - LIGHT FIXTURE OVER AV STAND EXTEND FROM CEILING
2	AND PROTRUDE INTO WORK AREA (APPROX 6")
1	MAINT. SHELTER - INSIDE AV SUPPORT STAND DETENT MECHANISM ONLY ON ONE
2	SIDE - POSSIBLE DAMAGE TO AV WHEN IT BEING PLACED ON STAND AND TWISTIN
3	G ACTION RELEASES DETENT.
1	FCS: BLOWER HOUSING, BLOCKED BY MANUALS (SPACE PROBLEM)
1	FCS: NEED PLACES FOR GEAR AND EQUIP, MAPS, ETC. GENERAL SPACE UTILIZAT
2	ION HAS NOT BEEN PLANNED BASED ON CREW AND MISSION NEEDS. CREWS HAVE
3	IMPROVISED FOR OPERATIONAL CONVENIENCE.

MANPRINT*PRIMARY=COMM
Task=Other

Line of Comment	COMMENT
1	COMMUNICATIONS ONLY FUNCTION CORRECTLY WHEN A SINGLE SENDER TALKS TO
2	ONE OR MORE RECEIVERS, TWO OR MORE INCOMING MESSAGES (WIRE OR RADIO
3	INTERNAL/EXTERNAL ANY COMBINATION THERE OF CAN NOT BE DECIPHERED.
4	SOLUTION: MECHANICALLY SEPERATE THE FM RADIO LINES FROM THE WIRE LINE
5	S.
1	NOISE IN THE GCS INTERFERES WITH HEARING THE RADIOS AND TALK BETWEEN O
2	PERATORS. THE A.C., BLOWERS ON THE RADIOS, TELETYPE PRINTING, VACCUM
3	ON THE MAP BOARD, AND GENERATORS OUTSIDE ALL CONTRIBUTE TO THE PROBLEM
4	
1	COMMUNICATIONS BETWEEN FCS AND BRIGADE SHOULD BE HARD WIRE. WIRE CANN
2	OT BE JAMMED; IT IS SECURE. DURING COMBAT THE RPV WOULD CREATE ANOTHE
3	R UNIT ON A RADIO NET THAT IS ALREADY OVERLOOKED.
1	CLRS, MC: MUST TRY TO REMEMBER TO CHECK WIRE LINE CONTROL SETTING AND
2	RADIO CONTROL SETTINGS. UNDER PRESSURE IF POSSIBLE.
1	CLRS, MC: WIRE LINE CONTROL; IF ANYONE TRANSMITS ON A RADIO AND WIRE L
2	INE AND RADIO CONTROL AREN'T MATCHED, EVERYTHING IS FUZED OUT.
1	CLRS, MC: RADIO TRAFFIC IS THE MOST DIFFICULT MANAGEMENT PROBLEM.
2	WHEN I'M BUSY WITH SAY THE RGT PANEL, THE OTHERS MUST ANSWER RADIOS.
1	CLRS: FORTH MAN IS ON RADIOS (3) THEN SHOUTS TO MC. BUT IN WAR, WE
2	MAY NOT NEED THIS SPECIAL RADIO OPERATION

MANPRINT*PRIMARY=COMM
Task=Other

Line of Comment	COMMENT
1	CLRS: MC IN COPPERHEAD MISSION DURING TEST I HAVE TO TALK TO TOO MANY
2	PARTIES, AN FDC, DIV, IN A REAL MISSION(WAR) WE WOULD ONLY NEED TO
3	TALK TO FDC.
1	OPERATOR HEADSETS: THE EAR CUPS DO NOT SWIVEL AND DO NOT NECESSARILY
2	CONFORM TO THE OPERATOR'S FEATURES. RESULTING IN OPERATOR DISCOMFORT
3	MISSION COMMANDERS SELDOM WEAT HEAD SETS.
1	EFFECT ON RPV ON MSE (MULTIPLE SUBSCRIBER EQUIPMENT): DIVISION IS GOIN
2	G TO GO MSE FAIRLY SOON. HOW DOES RPV IMPACT ON THEM? WITH MSE, WIRE
3	MAN WILL SOON DISAPPEAR.
1	PLATOON THAT NOW SUPPORT THE TOC DISAPPEARS. DROP A BOX AND YOU HOOK
2	UP TO IT AND DIAL YOUR CODE AND YOU DIAL INTO A COMPUTERIZED SYSTEM AN
3	D MY # 103 WOULD BE MINE FOREVER. HOW DOES THE FCS INTERFACE WITH MSE
4	? HOW DOES THE RPV BATTERY INTERFACE WITH A UNIT THAT HAS MSE?
1	THEY EXPERIENCED ALMOST AN ONGOING CONVERSATION USING THE FM RADIO. I
2	F RPV HAD TO BE EMPLOYED IN A LARGE TACTICAL MANEUVER, IT WOULD ONLY B
3	E ONE SOURCE AMONG MANY. A DISCIPLINED NET WOULD REDUCE THE AMOUNT OF
4	TRAFFIC. THIS PROBLEM IS THE RESULT OF A TEST ARTIFACT. WOULD NEED
5	A LANDLINE IN ACTUAL FIELD OPERATIONS.
1	REMOTE VIDEO MONITOR-IN TOC. WITH A MICROWAVE SHOT IT IS NOT VERY PRA
2	CTICAL. IF THEY WENT TO A HARDWIRE LINK WITH THAT MONITOR YOU WOULD E
3	LIMINATE THE PROBLEMS THEY HAD IMPOSITIONING IT, IN ORDER TO HAVE CLEA
4	R LINE-OF-SIGHT BETWEEN THE TOC AND FCS.
1	SHOULD BE ABLE TO GAIN A COMMO LINK THAT YOU NEED OVER THE SAME WIRE.
1	TOC VIDEO OBSERVER SHOULD BE ABLE TO TALK BACK TO THE FCS.
1	CRITICAL: LANDLINE BETWEEN TOC AND FCS. WILL HAVE TO DETERMINE WHICH
2	IS THE BEST MEANS; E.G., MICROWAVE, ETC.
1	CRITICAL TO HAVE THE REMOTE VIDEO MONITOR IN THE TOC.
1	EACH TOC WILL HAVE A MONITOR THAT SHOWS IN REAL-TIME WHAT THE RPV SEES
2	. DIVISION TOC.
1	COMMUNICATIONS: YOU CAN'T UNDERSTAND THE COMMANDER'S INTENT UNLESS YO
2	U COMMUNICATE AND UNDERSTAND THE REQUIREMENTS OF THE MISSION UNLESS YO
3	U COMMUNICATE.
1	MANY TIMES THERE ARE COMMO PROBLEMS WITH THE BATTERY. THERE IS A SHOR
2	TAGE OF RADIOS. SECOND, THERE ARE MAINTENANCE PROBLEMS WITH RADIOS TH
3	EY GIVE ME. THIRD, THERE IS A HEADSPACE AND TIMING PROBLEM WITH BATTE
4	RY I/O OPERATIONS OF THESE RADIOS. FAILURE TO UNDERSTAND HOW TO WORK
5	IN A SECURE MODE. FAILURE TO KNOW HOW TO PERFORM PROPER PMCS MAINTENA
6	NCE ON RADIOS, AND WHEN WE SENT SOMEONE DOWN THERE, WHAT WE DID TO FIG
7	URE OUT WHAT WAS WRONG WITH YOU COMMO SYSTEM, I.E. IF YOU TURN THE
1	RIGHT SWITCH, YOU'RE SUPPOSED TO BE HOLDING. THERE WAS GOOD COMMO,BUT
2	THEY COULDN'T FIGURE THAT OUT. THEY ALSO WERE NOT WIRED INTO THE GROU
3	ND AND THIS CAUSED A NUMBER OF COMMO PROBLEMS WHEN THEY WANTED TO GO
4	OUT ON OTHER MEANS OF COMMO AND TRANSMIT DATA AND TRANSMIT ORDERS. TH
5	E END RESULT IS YOU HAVE A UNIT RUNNING AMUCK OUT THERE THAT YOU COULD
6	NOT CONTROL BECAUSE YOU COULD NOT COMMUNICATE CLEARLY WITH FOR A VARIE
7	TY OF REASONS. THEY END UP IN THE UNIT STRUCTURE OF BEING AN ADD-ON
1	WHICH FAIRLY QUICKLY BECOMES AN AFTER-THOUGHT,BECAUSE THEY'RE NOT
2	TO THE DIVISIONAL CONTROL SYSTEM.
1	SIMULTANEOUS TRANSMISSIONS INTO THE GCS RADIOS SCRAMBLE UP ALL TRANSMI
2	SSIONS.

MANPRINT*PRIMARY=COMM
Task=Other

Line of Comment	COMMENT
1	THE WALKIE-TALKIE TRANSMISSIONS INTERFER WITH THE NDU.

MANPRINT*PRIMARY=PMCS
Task=Other

Line of Comment	COMMENT
1	PMCS MAINTENANCE: CANNOT READ DIP STICK IN HYDRAULIC RESERVOIR FOR
2	BARRIER STRUCTURE ON RV

MANPRINT*PRIMARY=TOOL SUPPLY
Task=Other

Line of Comment	COMMENT
1	MEN HAVE BROUGHT THEIR OWN TOOLS BECAUSE OF LACK OF SUPPORT

MANPRINT*PRIMARY=PARTS SUPPLY
Task=Other

Line of Comment	COMMENT
1	MOVING AV FROM RECOVERY NET TO CARGO TRUCK: RETENTION PIN (WHICH HOLDS
2	AV TO CARGO TRUCK HOIST) FELL OFF EQUIPMENT ONTO GROUND DURING
3	RECOVERY OPERATIONS.
1	ELECTRICAL CABLES: MANUALS (-20) REFERENCE CABLES BY NUMBER BUT LABELS
2	ON CABLES ARE DIFFICULT TO FIND. CABLE TAGS SLIDE DOWN AND CAN'T BE
3	SEEN
1	MISSION SUPPORT VEHICLES ARE LIMITED BY COMMAND. THUS PARTS ARE OFTEN
2	UNAVILIABLE.
1	SUPPLY: NOT ENOUGH TENTS. 10 PEOPLE IN 6 MAN TENT
1	SUPPLY, MS: METHELETHELKEYSTONE,(CLEANER AND PAINT REMOVER) WILL NOT
2	TAKE NEW PAINT OFF AV.

MANPRINT*PRIMARY=MAINT LEVEL
Task=Other

Line of Comment	COMMENT
1	GCS RADIOS HAVE NOT WORKED IN THREE YEARS
1	WATER TRAILER IS IN POOR CONDITION.
2	ONLY TANK AND TIRES ARE ANY GOOD

MANPRINT*PRIMARY=MAINT MANUALS
Task=Other

Line of Comment	COMMENT
1	MAINTENANCE MANUAL: NEED MORE TECHNICAL INFORMATION. NEED LOGICAL
2	FLOW IN ORDER TO TRACE FAULT THROUGH TO FIX. GCS FAULTS ARE MOST DIFFI
3	CULT TO TRACE. NEED TO BETTER UNDERSTAND FUNCTIONS AND RELATIONSHIPS
4	BETWEEN COMPONENTS. ALSO NEED BETTER INDEXING AND TABLE OF CONTENTS.

MANPRINT*PRIMARY=OPER MANUALS
Task=Other

Line of Comment	COMMENT
1	WE NEED A COMPLETE SET OF TM'S IN A CENTRAL BATTERY LOCATION LIKE THE
2	CLRS GCS--JUST TO BE SURE EVERYONE CAN GET ACCESS TO THE TM INFORMATIO
3	N.
1	TM DEP 55-1550-200-10 TASK 2-11 GROUND CONTROL STATION SHUT DOWN
2	IS THE REVERSE OF TASK 2-10 ACTIVATE AND CHECK OUT. IF TASK 2-10
3	IS CORRECT THEN TASK 2-11 COULD BE REDUCED FORM APPROXIMATELY 15 PAGES
4	TO 2 PAGES INCLUDING THE STATEMENT GROUND CONTROL STATION SHUT DOWN IS
5	DONE IN THE REVERSE OF ACTIVATE AND CHECK OUT.
1	TM DEP 55-1550-200-10-3 TASK 2-27. CONDENSE ALL NOTES, WARNINGS,
2	CAUTIONS. MOVE THEM TO THE FRONT OF THE TASK. IF THIS TASK CAN BE
3	COMPLETED USING ABBREVIATED PROCEDURES THEN ABBREVIATED PROCEDURES
4	SHOULD BE THE NORM. ADD TO TAS 2-27, MARCH ORDER OF THE LAUNCH SUB-
5	SYSTEM IS ACCOMPLISHED BY COMPLETING THE REVERSE OF EMPLACE LAUNCH
6	SUBSYSTEM. DELETE TASK 2-30 LAUNCH SUBSYSTEM MARCH ORDER. THIS WOULD
7	REDUCE THE NUMBER OF PAGES THAT THE OPERATOR WOULD HAVE TO LEAF THROUG
1	TM DEP 55-1550-200-10 SERIES TASK 2-12 GROUND CONTROL STATION MARCH
2	ORDER IS THE REVERSEOF TASK 2-9. TASK 2-12 COULD BE REDUCED TO 2 PAGES
3	BY USING THE STATEMENT: GROUND CONTROL STATION MARCH ORDER IS
4	COMPLETED BY DOING THE REVERSE OF TASK 2-9 DELETE TASK 2-12 ENTIRELY.
5	THIS ACTION WOULD REDUCE THE NUMBER OF PAGES THAT THE OPERATOR WOULD
6	HAVE TO LEAF THROUGH.
1	ADD TO TASK 2-28 LAUNCHER SUBSYSTEM SHUT DOWN IS COMPLETED BY DOING
2	THE REVERSE OF ACTIVATION AND CHECK OUT LAUNCH SUBSYSTEM. THIS WOULD
3	REDUCE THE NUMBER OF PAGES THAT THE OPERATOR WOULD HAVE TO LEAF
4	THROUGH.

MANPRINT*PRIMARY=MAINT PROC
Task=Other
Line of Comment   COMMENT

1 88Z'S VEHICLE FROM FT LEWIS ARE FIELDED BUT NOT SERVICED
1 IF THE RPV EQUIPMENT BREAKS IT'S GOING TO BE FIXED BY GS MAINTENANCE L
2 EVEL. HOW DOES THAT WORK? THERE IS A PLAN ON PAPER; I'VE GOT THAT PA
3 PER. IT WAS DRAWN UP ON A PIECE OF TABLET PAPER AND GIVEN TO THE DIVI
4 SION. THAT WORKS GOOD FOR OT II, BUT WHAT HAPPENS WHEN YOU HAVE ALL T
5 HE EQUIPMENT (1200 VEHICLES) ASSETS. I THINK A LOT OF THE SYSTEM, IT
6 HAS THE POTENTIAL, BUT HOW ARE YOU GOING TO FIX IT?
1 THE RECOVERY VEHICLE HAS METRIC HYDRAULIC LINES AND FITTINGS BUT THE U
2 NIT HAS NO METRIC FABRICATION CAPABILITY.. I MADE THAT COMMENT AT FORT
3 SILL. IASKED WHOSE FITTINGS, ETC., WERE YOU USING AND THEY SAID NOBO
4 DY'S, THEY ARE ALL DIFFERENT. THERE OUGHT TO BE A PUSH PACKAGE THAT C
5 OMES DOWN FROM CORPS TO DIVISION. PACKAGE SHOULD HAVE SOME GS MAINTEN
6 ANCE WITH IT, LIKE A CONTACT TEAM, TWO OR THREE MEN AND A CONTACT TRUC
7 K. CARRIES SELECTED (HIGH FREQUENCY) ITEMS, HIGH TURN-OVER ITEMS.
1 COMES WITH THE RPV BATTERY AND IT MUST COME DOWN FROM CORPS. ATTACHED
2 TO THAT BATTERY, THE BATTERY RECEIVES ITS OPCOM, WITH ATTACHMENT ORDER
3 S TO A DIVISION. SO YOU TASK ORGANIZE THE BATTERY TO INCLUDE A PLL PA
4 CKAGE SUPPORTS LIFE AND IT COMES DOWN WITH IT. MUST HAVE THE CAPABILI
5 TY TO BE ALMOST SELF-SUFFICIENT.

MANPRINT*PRIMARY=OPER PROC
Task=Other
Line of Comment   COMMENT

1 FUEL CONSUMPTION ISN'T COMPUTED PROPERLY. WEATHER & RPM AFFECT CONSUM
2 TION. PRESENT FUELING METHODS INAPPROPRIATE. USE THE ROLL INHIBIT TO
3 KEEP WING OUT OF LINE OF SIGHT WHEN LOCKED ON TARGET.
1 FUEL INFORMATION-USUALLY WRONG. FUEL INDICATORS UNSATISFACTORY.
1 IT TAKES TOO LONG TO SURVEY IN THE RPV COMPONENTS-IN WARTIME, YOU MIGH
2 T NOT HAVE PADS, MAKING THIS TAKE EVEN LONGER.
1 THERE WAS QUITE A BIT OF AWE AT THE DIVISION OPERATIONAL LEVEL TO UNDE
2 RSTAND HOW THEY COULD SPEND SO MUCH TIME IN THE FIELD AND NOT HAVE LEA
3 RNED THOSE FIELD SURVIVAL SKILLS WHICH ARE REQUIRED OF ALL OF US. QUI
4 TE A BIT OF PHASE I OT II WAS FOCUSED ON TRAINING THE BATTERY HOW TO B
5 E SOLDIERS AND LIVE TO THE 1ST DIVISION'S STANDARDS IN A FIELD ENVIRON
6 MENT. CONSISTENT EMPHASIS ON DIVARTY, 2ND BDE, DIV TACTICAL COMMAND P
7 OST TO DISCIPLINE THAT UNIT FROM THE FIELD ENVIRONMENT.
1 MISCELLANEOUS: BECAUSE OF THE FACTORS, THERE WAS STRONG PROPENSITY FO
2 R THE MISSION COMMANDERS, PARTICULARLY THE CLRS MISSION COMMANDER, NOT
3 TO DEAL FACE TO FACE WITH THE PLANNING ELEMENTS AT THE DTOC LEVEL. AL
4 MOST FLATLY REFUSED TO, USED EVERY EXCUSE IN THE WORLD NOT TO GO TO TH
5 E DTOC AND SIT DOWN FACE TO FACE WITH MYSELF AND MY OP OFFICERS, MY G-
6 2, MY FIRE SUPPORT OFFICERS AND TALK THROUGH THAT MISSION PLAN, THE CO
7 NCEPT THAT WE WERE PUTTING TOGETHER TO FLY THAT MSN. THEY WOULD ACCEPT
1 FM RADIO,WIRE IF WITHIN DISTANCE, SENT RUNNER (PFC TO E-6). THEY HAVE
2 A LEADERSHIP PROBLEM IN GOING FACE TO FACE W/MEN WHO WERE PLANNING THE
3 MSN, THOSE WHO GET PAID TO DO THAT, WHO UNDERSTAND THE DIV TO MAKE THE

MANPRINT*PRIMARY=OPER PROC
Task=Other
Line COMMENT
of
Comment

4 RESOURCHING AND PRIORITY DECISIONS THAT AFFECT THE DAY-TO DAY EXISTENC
5 E OF WHAT THAT BATTERY'S FUNCTION IN LIFE IS WITHIN THAT DIVISION. TH
6 EY WOULD NOT COME AND TALK TO US.
1 (QUESTION: MAYBE THEY ARE INTIMIDATED BY THE RANK?) THEY'RE HAPPY IN T
2 HEIR OWN LITTLE WORKD AND DIDN'T WANT TO COME OUT OF THEIR LITTLE WORK
3 D TO FIND OUT HWAT WAS GOING ON WITH US. WHEN YOU HAVE THINGS GO WRON
4 G-THE BATTERY COMMANDER IS SOMEWHERE ELSE-NOT AT THE CLRS-WHEN YOU HAV
5 E SOMETHING WRONG OR YOU ARE RECOVERING OR YOU ARE GETTING READY TO MO
6 VE. THE LEADERSHIP AT THE BATTERY AT THE CLRS (CW3) WAS DISTRACTIVE A
7 ND THE MISSION COMMANDER CAN USE THESE DISTRACTIONS AS MUCH AS HE
1 WANTS TO. HE CAN SAY, "OK, SGT YOU'RE GOING TO DO THIS THIS TIME, I'M
2 GOING TO STAY HERE AND MAKE SURE THE BATTERY MOVES OR MAKE SURE THE VE
3 HICLE GETS FIXED, ETC." I TAKE IT THAT FORT SILL THEY HAD ANOTHER HEA
4 DQUARTERS TO INTERFACE WITH. I DON'T THINK HE HAD A DIVTOC SITTING OU
5 TSIDE TO TALK TO. WHAT HE PROBABLY WAS TRAINED TO DO AT FORT SILL WAS
6 GET ON TOP OF THE PROBLEM HE HAD RIGHT THERE IN THE BATTERY. HE DIDN'
7 T LEARN TO TRAIN THE NEXT GUY IN LINE ON WHAT HE HAD TO DO WHILE HE
1 WENT OVER TO COORDINATE WITH THE TACS OR PICK UP ORDERS. HASN'T BEEN
2 TRAINED TO DO THAT. WHEN HE'S TAKING CARE OF HIS PROBLEMS, HE HAS TO
3 TAKE CARE OF THEM PERSONALLY.
1 LEADERSHIP: WHEN PLANNING AND DEVELOPMENT, FACE-TO-FACE IS THE MOST E
2 FFECTIVE. IN THIS DIVISION, THE WAY WE CONDUCT OUR ORDERS PROCESS, OU
3 R COMMANDING GENERAL, OR ASSISTANT DIVISION COMMANDER, PUTS OUT A TIME
4 AND LOCATION, HIS BRIGADE COMMANDERS MEET HIM THERE, AND HE GIVES HIS
5 ORDERS BRIEF AT THAT TIME. THE S-3S DON'T ATTEND. HE IS FACE-TO-FACE
6 WITH THE DIVISION COMMANDER OR ASSISTANT COMMANDER. THERE IS A CLEAR
7 CUT UNDERSTANDING OF THE INTENT AND FUNCTION. FOLLOWING THAT, IT
1 WORKS JUST LIKE A CLOCK AND WHEN IT DOESN'T, PROBLEMS ARE CREATED.
1 OCT 85 POSITION AT FORT SILL: YOU GET ME THE BATTERY COMMANDERS AND I
2 WILL ISSUE MY ORDER TO THE COMMANDER. IT WAS TO BE ISSUED TO DIVISIO
3 COMMANDER AND NOT TO BATTERY COMMANDER. MY REPLY, "I DON'T WANT TO D
4 EAL WITH THE SECOND IN COMMAND." THAT WAS THE RULE OF ENGAGEMENT; YOU
5 HAD TO DEAL DIRECTLY WITH THE MISSIONS COMMANDERS, THEMSELVES. THAT W
6 AS A RESTRAINT IMPOSED BY FORT SILL AND REINFORCED BY OTEA DURING THE
7 CONDUCT OF THE TEST.THE BATTERY COMMANDER, IN EFFECT, IS A "LAME-DUCK"
1 1687
2 THE BATTERY DID NOT PROCTICE CONCEALMENT DURING THE TEST. WE ALWAYS DE
3 PLOYED IN THE OPEN. WE'S GET OUR ASSES SHOT OFF.
1 THE MAINTENACNE SHELTER MAY CO-LOCATE WITH A FULL BATTERY. WE COULD B
2 E SWAMPED WITH AV'S. WE HAVE NO WAY TO EVACUATE THE AV'S IN AN EMERGE
3 NCY.
1 CLRS. MC: AFTER LAUNCH I HAVE TO START MOST MY TASKS. (PLANNING, DGM
2 RADIOS) BUT IF A TARGET IS DETECTED I'VE GOT TO JUMP OVER TO DMD AND
3 MY MONITORING OF THE DGM PLANNING, ETC, IS INTERRUPTED.
1 STRESS: SYSTEM IS NOT STRESSFUL BUT THE WAY WE ARE OPERATING, THE
2 UNKNOWNS, AND THE CONSTANT JUDGEMENTS.
1 GCS ORDERED TO TEAR-DOWN AND MOVE; THEN ORDERED TO PREPARE FOR LAUNCH
2 INSTEAD, COMMAND ELEMENTS ARE INDECISIVE, MANY COMMANDS ARE COUNTER
3 MANDED MINUTES LATER. FEELINGS ARE THAT THE SYSTEM (RPV) IS NOT BEING
4 TESTED; THE PEOPLE ARE BEING TESTED. FEELINGS EXPRESSED THAT MEN ARE

MANPRINT*PRIMARY=OPER PROC
Task=Other

Line of Comment	COMMENT
5	ON A HARDSHIP DUTY. YET THE COMMAND ARE UNCONCERNED WITH THE MENS'S
6	PLIGHT
1	CLRS. MC: DURING TEST THERE IS NO TIME TO DO A MISSION PLAN. WE GET
2	THE ORDER THEN WE PLOT WP 1-2, LAUNCH, TARGET LOCATION, USE DMD, AND
3	REQUEST PERMISSION FOR ALL ACTIVITIES
1	NEEDS TARGET LIST FROM FSO. CAN'T DO IT OVER RADIO, NED WIRE (HARD CO
2	PY). LOOKS LIKE A MANNING PROBLEM; 2 MISSION COMMANDERS, ONE FLYING A
3	ND ONE BACK AT BRIGADE. FLIP FLOP COMMANDERS. MAYBE ONE OTHER PERSON
4	.
1	AV FUEL CONSUMPTION IS UNPREDICTABLE. FUELING/DEFUELING IS UNSATISFAC
2	TORY.
1	SHOULD NOT PUT LIMITS ON WHERE THE CLRS AND FCS SHOULD BE LOCATED. WH
2	AT YOU WANT TO DO IS FIND WHAT'S OUT THERE. SHOULD NOT PUT ARTIFICIAL
3	CONTRAINTS ON HOW TO EMPLOY THE RPV.
1	EIR REQUIREMENTS, IF YOU'RE GOING TO ASSOCIATE THAT BATTERY WITH A
2	DIVISION THAT'S GOING TO FIGHT TO IN EUROPE. IF THE BATTERY ARRIVES
3	30 DAYS AFTER IT'S SHIPPED OR 14 DAYS AFTER ITS SHIPPED FROM FT HOOD,
4	IT'S TOO LATE. WHEN THE DIVISION GETS THERE, THE RPV MUST BE ABLE TO
5	PROVIDE INFORMATION WITHIN A SHORT TIME. IF IT GETS THERE AFTER WE HI
6	T THE LD, ITS GOING TO BE TOO LATE. IT NEEDS TO HAVE A RAPID TRANSIT
7	CAPABILITY. NEEDS TO BE ABLE TO BE AIR-LOADED. TASK ORGANIZE (CONT)
1	CONT) IT IN THE STATES, CUT THAT FLIGHT LOOSE FROM CORPS HERE. IF IT
2	GOES WITH CORPS, FORGET IT. GOT TO MAXIMIZE ITS UTILIZATION POTENTIAL
3	. NEEDS TO LOOK OUT IN FRONT OF THAT DIVISION BEFORE IT ATTACKS. 1ST
4	CAV DIV MISSION IS TO FIGHT IN EUROPE/WE NEED THE RPV TO OPERATE WITH
5	US IN EUROPE. IT'S GOING TO BE A COME AS YOU ARE WAR.
1	THE HIGHER YOU GET IN THE ORGANIZATIONAL LEVEL, DIVISIONAL RANK STRUCT
2	URE, THE LESS YOU BECOME CONCERNED WITH TACTICS. THE CONCERN BECOMES
3	ONE OF SUSTAINABILITY OF YOU FIGHTING FORCE. DURING THE TEST WE HAD A
4	N ARTIFICIAL SITUATION, DIDN'T EVEN HAVE A FULL BATTERY, IT WAS A QUIC
5	K FIX FOR THE PURPOSES OF THE TEST. DURING A REAL SITUATION WE'RE TAL
6	KING MINIMUM OF 50, MAXIMUM 125 KILOMETERS. THE TOOTH AND THE TAIL CA
7	N BE WITHIN THAT DISTANCE. LOTS OF CARE MUST BE TAKEN IN DEVELOPING
1	THE STRUCTURE FOR THE BATTER FOR CONTINUOUS OPERATIONS. (THE WHOLE
2	RPV BATTERY AND BN WERE NOT ACTUALLY SEEN). THERE IS NO ADEQUATE DOC
3	TRINE THAT ARTICULATES TO THE DEGREE NECESSARY HOW SUSTAINMENT OPERATI
4	ONS WILL BE CONDUCTED FOR THAT FCS ALL THE WAY FROM THE CORPS REAR FOR
5	THAT BATTERY WITHIN THE DIVISIONAL AREA, AS IT RELATES TO THE POSITIO
6	N ON THE GROUND, AS IT RELATES TO THE CORPS, ETC. HAVE NO EXPERIENCE
7	HOW THIS TEST RELATES TO THE REAL SITUATION. HOW CLOSE DOES THIS OT
1	COME TO AN ACTUAL REAL WORK EXPERIENCE? MY IMPRESSION IS THAT IT TOOK
2	A LARGE NUMBER OF PEOPLE TO SUPPORT THIS FRAGILE SYSTEM DURING THE OT
3	WHAT WILL IT TAKE TO SUPPORT IN A COMBAT ENVIRONMENT? POSSIBLE MAN
4	POWER PROBLEMS. WHERE ARE ALL THESE PEOPLE GOING TO BE TRAINED? WHE
5	RE TRAINED?
1	RPV NEEDS BE MOUNTED ON PRIME MOVERS THAT CAN KEEP PACE WITH THE MANEU
2	VER UNITS; E.G., 548 OR HEMMET. MANY TIMES THEY HAD TO SELECT A SITE
3	FOR THE TOC THAT WAS COMPATIBLE WITH THE RPV BATTERY VEHICLES. FCS TR
4	AFFICABILITY MUST MATCH THAT OF A HEAVY MANEUVER BRIGADE.
1	MUST HAVE THE SAME TRAFFICABILITY AS THE TOC VEHICLES. TRUCKS WILL NO

MANPRINT=PRIMARY=OPER PROC
Task=Other

Line of Comment — COMMENT

2 T DO AS PRIME CARRIERS.
1 CAMOUFLAGE, COVER AND CONCEALMENT: ALL AREAS WHERE THEY WANT TO PULL
2 OUT TO SHOOT ARE OUT IN THE OPEN ONTHIS POST. DIFFICULT TO TAKE A GOO
3 D LOOK AT CAMOUFLAGE, COVER, ETC., ON FORT HOOD. RPV MADE A VALIANT E
4 FFORT TO CAMOUFLAGE, AND GO BACK TO HID AND PULL OUT FROM HIDE TO LAUN
5 CH, ETC. THINK THEY (RPV) KNEW WHAT THEY WERE DOING. THEY LEARNED.
6 THEY ARE VERY VULNERABLE WHEN THEY PULL OUT. THE DEPLOYMENT OF THE RE
7 COVERY NET MADE IT EASY TO TELL WHERE THE UNIT WAS LOCATED. LAUNCH
1 RAIL MADE IT EASY TO LOCATE THEM. THE RPV PEOPLE ARE SO INTENT ON WHA
2 T THEY'RE DOING THAT THEY'RE NOT GOING TO HEAR THE THREAT SNEAK UPON T
3 HEM ONE HIND D WOULD WIPE THEM OFF. FELT THAT THE RPV PERSONNEL SUFF
4 ERED FROM FIELD BURNOUT AND BECAME A LITTLE LAX ON TACTICAL EMPLACING,
5 ETC. TRIED NOT TO MOVE EQUIPMENT SO MUCH, OR IT BROKE ALOT.
1 WHAT WAS THE REASON THAT THE CLRS HAD THE ONLY LAUNCH CAPABILITY? KEE
2 P THE FCS STREAMLINED AND NOT TO HAVE TO CARRY THAT EQUIPMENT. RECOMM
3 END: THEY WOULD LIKE TO HAVE EACH FCS TO BE ABLE TO LAUNCH AND WOULD
4 FALL UNDER THE DIRECT CONTROL OF THE UNIT HE'S SUPPORTING. BOC NOW TU
5 RNS INTO MAINTENANCE OFFICER/SUPPORT OFFICER AND KEEPS CONTROL THAT WA
6 Y AND MAKES SURE THEY ARE OPERATIONAL. NO LONGER WOULD BE A COMMAND C
7 ENTER AS THEY NOW ARE CONTROLLED BY THE UNIT ATTACHED TO.
1 WE'RE WASTING FLIGHT TIME GOING TO A WAY POINT. THE ARMORED UNITS ARE
2 MOVING ESSENTIALLY AT THE SPEED THE RPV IS. WE'RE WITHIN DIRECT FIRE
3 RANGE. THE UNIT THAT FIGHTS YOUR BATTLE NEEDS THE INFORMATION THE RPV
4 CAN PROVIDE. WHAT YOU'RE GIVING UP IS THE GROUND BETWEEN THE FCS AND
5 THE CLRS. YOU'RE GAINING THAT IF EACH UNIT HAS ITS OWN CLRS. MAY BE
6 POSSIBLE TO HAVE A CENTRAL RECOVERY AND FCS ABLE TO LAUNCH. EACH FCS
7 WOULD NOT HAVE A RECOVERY VEHICLE OR LOOK FOR SOME OTHER MEANS OF
1 RECOVERY; I.E., PARACHUTE.
1 PRESENT LOCATION INTERFERES WITH MISSION TIME (CUTS DOWN ON TIME). WO
2 ULD SAVE TIME IF ONE STATION COULD LAUNCH AND CATCH IT. THE CLRS COUL
3 D CONTROL THE BIRD (ONE CASE) AND COULDN'T HANDOFF. WE IMMEDIATELY HA
4 D THE CLRS CONTROL THE MISSION AND DROP THE FCS OUT AND TURNED IT INTO
5 A DIVISION FLIGHT RATHER THATN AN FCS FLIGHT. MANY TIMES WE COULDN'T
6 GET THAT LINK BETWEEN THE FCS AND THE BIRD WHILE UNDER CLRS CONTROL.
7 WE NOW EXTEND THE RANGE AND MISSION TIME BECAUSE WE HAVEN'T HANDED OFF
1 WE'VE GOT TWO CLRS RIGHT NOW, WE COULD GIVE ONE OF THEM TO THE DIVISIO
2 N. RECOMMEND: GO WITH FOUR CLRS, THREE UP AND ONE WITH DIVISION. THI
3 S WOULD INCREASE THE ABILITY TO CROSS USE EACH RPV SECTION. IF A LAUN
4 CHER WENT DOWN IN ONE, WE COULD HAVE ANOTHER SECTION LAUNCH OUR BIRD.
5 WOULD MAKE THE SYSTEM REDUNDANT AND INCREASE THE RELIABILITY TO PERFOR
6 M THE MISSIONS.
1 WE NEED A VEHICLE TO RETRIEVE DOWNED AV'S. IF THE HANDLER LEAVES WE H
2 AVE NO AV HANDLERS TO LOAD THE LV OR SHUTTLE TO THE MAINTENANCE SHELTE
3 R. WHY NOT HAVE A SMALL VEHICLE JUST FOR SHUTTLING OR RETRIEVING AV'S
4 ?
1 DUE TO TEST RESTRAINTS THERE WERE ALOT OF THINGS THAT COULDN'T BE TEST
2 ED. THE WAY THINGS WERE SET UP DOCTRINALLY, FCS IS WORKING WITH THE F
3 ORWARD BRIGADES. THEY'RE THE ONES WHO HAVE THE ABILITY TO LOOK DEEPES
4 T AND THE PEOPLE THAT TNEED THAT INFORMATION IS US (DIVISION) WHO HAVE
5 THE CLRS, WHO AREN'T GOING TO LOOK THAT DEEP, SO OUR TRANSMISSION OF I

MANPRINT*PRIMARY=OPER PROC
Task=Other

Line of Comment	COMMENT
6	NFORMATION ON WHAT WE CONSIDER CRITICAL IS OUT HERE WITH THE BIRD THAT
7	CAN GO OUT AND LOOK AT IT, BUT IT'S BEING GENERATED BACK TO PEOPLE
1	THAT DON'T WANT TO BE LOOKING OUT HERE AND DON'T HAVE THE NEED NECESSA
2	RILY TO LOOK OUT HERE, THEY'RE WANTING TO LOOK HERE. SO FOR US, WITHI
3	N OUR PRIORITY THAT WE HAD TO DO TO LOOK
4	MESS UP THEIR TIME AND THEIR ABILITY TO LOOK AT THINGS THEY NEEDED TO
5	DO AND TAKE TIME AWAY FROM THEM. SO THEY WAY OUT HER
6	E AND MESSED UP THE MISSION. THE CONTEXT IS NOT A WORKABLE CONTEXT
7	UNDER BATTLE CONDITIONS.

MANPRINT*PRIMARY=EQUIP DESIGN
Task=Other

Line of Comment	COMMENT
1	FCS: POOR AIR (HEAT AND COOL) CIRCULATION - DUCTING FOR AIR AND HEAT
2	CIRCULATION NOT EFFECTIVE IN ACHIEVING UNIFORM DISTIBUTION
1	FCS: END OF TAPE LIGHT VISIBLE ENOUGH TO GET ATTENTION DURING
2	OPERATION- NO AURAL INDICATION TO SUPPLEMENT
1	FCS: HOLD DOWN BRACKET SCREWS FOR NDU (NAVIGATIONAL DISPLAY UNIT) CAN
2	NOT BE INSERTED WITH MOPP GLOVES. FOR TRANSPORT STORAGE OF PLOTTER, AR
3	M SCREW MUST BE IN PLACE AS DESIGNED. SCREW NOT OPTIMUM SOLUTION FOR T
4	HIS REQUIREMENT
1	FCS: NEEDS SIMPLE LATCH TO HOLD LATCH TO HOLD PLOTTER, ARM IN PLACE FO
2	R TRANSIT
1	FCS: DATA CONNECTION TO DMD- NO CONTACT FOR IT- BOTTOM OF MC CONSOLE-
2	OPERATOR MUST IMPROVISE TIGHTENING METHOD WITH UNIT IN PLACE ON
3	CONSOLE
1	RECOVERY-HYD. CONTROL LEVERS DO NOT FOLLOW EXPECTED PATTERNS FOR CONTR
2	OL. OPERATOR FEELS MOVEMENT SHOULD CORRELATE WITH DIRECTION OF
1	MAINT SHELTER - CRANE HOLD DOWN FIXTURES BREAK AND RELEASE CRANE
2	DURING TRANSIT. METAL IS CAST MATERIAL AND FAILS EASILY UNDER PRESSUR
3	E. OPERATORS IMPROVISED WITH NYLON TIE DOWNS.
1	MAINT SHELTER - AV HOIST - MOVEMENT WITH AV IN PLACE CANNOT BE ACCOMPL
2	ISHED BY 2 MEN. LEVERAGE IS SUCH THAT ROLLER BIND. NEEDS THREE MEN T
3	O OPERATORS. SHELTER DOOR IS SMALL FOR BRINGING AV INSIDE. NEED ONE
4	MAN TO PROTECT AGAINST SWAY DAMAGE.
1	MAINT SHELTER- FIXTURE FOR DUCTING AIR TO AV FOR INSTRUMENTATION COOLI
2	NG CANNOT BE ATTACHED BECAUSE OF PROTRUDING BOLT. COOLING DURING
3	MAINTENANCE IS COMPROMISED.
1	GCS: AS MANY SYSTEM PARAMETERS AS POSSIBLE SHOULD BE SENT TO THE APPR
2	OPRIATE SYSSYSTEMS VIA ELECTRONIC DATA LINKS FROM THE GCS.
1	GCS AT FCS: HEADSET - DESIGN- EARCUP DOES NOT HAVE LATERAL ADJUSTEMEN
2	T FOR ADJUSTING TO SIDE OF THE HEAD. HEIGHT ADJUSTMENT ONLY. CREW I
3	MPROVICES BY BORROWING ADJUSTABLE HEADSETS FROM OTHER SOURCES.
1	CLRS, AVO: CAN'T READ SCREEN AND KEY PANEL, AND SEE LINK LIGHTS ON
2	UPPER PANEL. THE LINK LIGHTS NEED TO BE LOWER.
1	RECOVERY, MOPP : WHEN SURFACES ARE WET MOPP BOOTS SLIP. NEED NON-SLIP

MANPRINT*PRIMARY=EQUIP DESIGN
Task=Other

Line of Comment	COMMENT
2	SURFACES..
1	FCS: WHY AIRBORNE VIDEO TAPE RECORDER? WHY MAX 30 MINUTE TAPES? OFF
2	THE SHELF EQUIPMENT IN CORPORATED IN FCS POORLY CHOSEN TO MATCH MISSIO
3	N REQUIREMENTS. AVAILABILITY OF 30 MINUTE TAPES FROM SUPPLY IS POOR.
1	WHEN THE COMMAND MODULE AT THE REAR OF THE LV IS REMOVED THERE IS EXTR
2	A POWER CABLE THAT ALLOWS THE MODULE TO BE PULLED OUT. BUT WHEN THE
3	MODULE IS REPLACED THE CABLE MUST BE PUSHED BY HAND INTO A VERY NARROW
4	CHANNEL. THE JOB IS TIME CONSUMING AND A KNUCKLE BUSTER.
1	DIRT AND MUD DRAIN FROM THE UPPER DECK OF THE LV INTO THE COMMAND MODU
2	LE COMPARTMENT AND OTHER LOWER COMPARTMENTS. THE ONLY WAY TO CLEAN TH
3	E INSIDE OF THE DECK IS TO STEAM HOSE IT. WE NEED BETTER FRAINS BECAU
4	SE CURRENT CLEANING PRACTICES MAY DAMAGE EQUIPMENT.
1	THE CRANE IN THE MAINTENANCE SHELTER JERKS AND JAMS WHEN ON-LOADING AN
2	AV. THE AV BOUNCES AROUND AND MAY GET DAMAGED.
1	WE CAN'T GET THE COOLING SHROUD ON THE AV WHEN THE AV IS ON THE MAINTE
2	NANCE SHELTER CRADLE. THERE'S A BOLT ON THE CRADLE FRAME THAT BLOCKS
3	ALIGNMENT OF THE SHROUD.
1	CANVAS AND BOW DRAWS TOO TIGHT ACROSS LV CRANE BASE. IT'S CUTTING CANV
2	AS AND BOWS.
1	FIBER OPTICS ARE A PROBLEM AROUND A COMBAT TOC. REMOTE VIDEO WIRE CAN
2	BE RUN WITH COAXIAL CABLE.
1	REAL PROBELM: FIGHTING A HEAVY ARMORED DIVISION WITH A SYSTEM THAT IS
2	WHEEL-BOUND. THOSE VEHICELS AFTER THE FIRST MOVE OUT ARE NO LONGER A
3	PART OF THIS DIVISIN. WOULD HAVE DIFFICULTY AT NTC AFTER A RAIN OR IN
4	A EUROPEAN ENVIRONMENT, ETC. THEY WOULD BE STUCK IN THE MUD AS THEY D
5	ID THE FIRST DAY HERE AFTER BEING A LITTLE DAMP. HARD TO RECOVER THEM
6	INITIAL DESIGN OF THE VEHICLES WAS POORLY THOUGHT OUT. GOT TO BE MOUN
7	TED ON TRACKS. IT'S GOT TO BE ABLE TO MOVE WITH THE SUPPORT UNIT (E.G
1	., 548, HEMET, ETC.). IT ALSO APPLIES TO THE RGT ON WHAT WILL PULL IT
1	GO BACK TO A FEW POINTS: 1. PUT BATTERY ON MORE SURVIVABLE EQUIPMENT
2	(TRACKS). 2. PAYLOAD IS A BERY GOOD THING. OUR PEOPLE WERE IMPRES
3	SED WITH THE CAPABILITIES OF THE PAYLOAD. ALL OF THAT SUPPORTING STUF
4	F THAT MAKES THE AIR VEHICLE GO UP IN THE AIR TO PERFORM ITS MISSION I
5	S A "HOUSE OF CARDS." I WILL TELL YOU RIGHT NOW THAT THE BATTERY WIL
6	L NOT SURVIVE IN THE FIRST 24 HOURS IN A COMBAT ENVIRONMENT BECAUSE IT
7	IS NOT HARDENED. GOT TO GET IT OFF THE WHEELS AND ONTO TRACKS TO GET
1	IT THROUGH THE THREE FEET OF MUD FROM POINT A TO B. WE'VE GOT A BARRI
2	ER TO LINK BETWEEN THE AV AND THE GCS BECAUSE SOME CARD IN THE GCS VAN
3	GOT BOUNCED ON A 2K MOVE OVER THE HARDBALL LAST NIGHT.
1	IF IT'S NOT SOLDIER PROOF AND SHATTER PROOF, IT'S NEVER GOING TO GET T
2	HE AV UP. GOT TO BE HARDENED IN TERMS OF COPING WITH ITS ENVIRONMENT,
3	THAT IS, MOVING OVER BROKEN TERRAIN AND SURVIVING THAT MORE AND REMAIN
4	ING IN A GOOD OERPATIONAL CONDITION. A GOOD JAPANESE TRANSISTOR RADIO
5	CAN DO THAT SAME THIMG. WHEN THE GCS MOVES IT SHOULD BREAK AND ALSO H
6	AVE THE CAPABILITY OF MOVING OVER ALL TYPES OF TERRAIN WITHOUT DAMAGIN
7	G THE EQUIPMENT. WE'RE GOING TO GO WITH THEMOR WITHOUT THEM; HAS TO
1	BE MANEUVERABLE. WOULD BE NICE IF THEY GO ALONG WITH US. MAY BE ABLE
2	ABLE TO AIRLIFT ALOT OF THE RPV EQUIPMENT (E.G., RGT).
1	SAFETY- LV AND AVH- PLATFORM WORKS SPACE NEED NOT BE AS RESTRICTED.
2	CREWMEN WORK CLOSE TO EDGE TO PLATFORM. POTENTIAL FOR ACCIDENTAL FALL

MANPRINT*PRIMARY=EQUIP DESIGN
Task=Other

Line of Comment	COMMENT
1	LAUNCH PREP. AV SUPPORT STAND LOWER THAN NEED BE FOR OPERATING CREW. P
2	OSTURE FOR WORKER PERFORMING OPERATION IS STRAINED AND UNNATURAL.
1	LAUNCH PREP. POSITION OF FUEL SERVICE UNIT INTERFERES WITH ASSEMBLY PR
2	OCESS. EXTENDS INTO WORK SPACE.
1	FAULT ISOLATER - DOES NOT SHOW ALL FAULTS ON THE RAIL FAULTS CANNOT BE
2	DUPLICATED. DATA FROM BIT BYT FROM GCS IS USED TO "THINK THROUGH"
3	PROBLEM FOR TROUBLE SHOOTING.
1	MY MOPP MASK CASE HIT THE HARD DISK DRIVE AS I WALKED THROUGH THE GCS.
2	THE DISH DRIVE SHUT DOWN.

MANPRINT*PRIMARY=MOPP-NBC
Task=Other

Line of Comment	COMMENT
1	HEADSETS AND MOPP NOT COMPATIBLE. MOPP MASK REMOVED BY SOLDIER
2	TO MOVE UNDER AV WING AND WORK ON COMPONENTS.
1	WE NEED AN NBC WARNING DEVICE IN THE AMINTENANCE SHELTER.
1	RGT, MOPP: WITH GLASSED IN MASK INSERT I COULD NOT LOOK THROUGH RGT
2	TELESCPOE. THE SUN'S GLARE WOULD COME THROUGH LENS BETWEEN EYE AND
3	TELESCOPE
1	BATTERY OP CENTER (BOC) HALF OF TROOPS IN MOPP4 DID NOT WEAR GLOVES BC
2	WORE WOOLEY GLOVES IN LIEU OF MOPP. INSUFFICIENT SUPPLIES CITED AS RE
3	ASON FOR LACK OF MOPP CLOTHING
1	MOPP GCS: ONLY ONE MAN WORE GLOVES, ONE SAID WE CAN'T PUSH BUTTOMS WIT
2	H GLOVES"-Q-REAL NBC? "WE'D HAVE THE DOOR CLOSED". "WE'D DO IT THE WAY
3	THEY SAY TO DO IT"....."WE DONT HAVE INSERTS AND THE GLOVES DON'T FIT
4	(SETTING UP 2ND LAUNCH SITE)
1	CLRS MOPP: IF MOPP GLOVE DOES NOT FIT FINGERS EXACTLY OPERATOR CAN NOT
2	TOUCH KEYS ON DMD TO OPERATE THEM.
1	87003: PHYSICAL SET UP IN AREA (CAMO NET, TENTS, CABLE LAY OUT ETC)NOT
2	ACCOMPLISHED IN MOPP GEAR. USUALLY GLOVES MISSING OR REPLACED BY DARK
3	CIVILLIAN WOOLEY GLOVES.
1	RAIN GEAR USED IN LIEU OF MOPP IN SOME CASES.
1	LV SET UP: 7 SOLDIERS IN MOPP NO GLOVES; NOT SUPPLIED/OR SUPPLI
2	ED AND UNSERVICABLE. CLAIMED THEY COULD COMPLETE ALL ASPECTS OF MISSIO
3	N WITH GLOVES BUT WOULD BE SLOWED DOWN.

MANPRINT*PRIMARY=STOWAGE
Task=Other

Line of Comment	COMMENT
1	CAMO NET. ON RV: NO PLACE TO STORE NET SECURELY. NET IS TO BIG FOR STO
2	WAGE AREA. MIGHT FALL OFF.
1	MARCH, HASTY, MS: CAN'T TRAVEL WITH AV IN CRADLE. MUST HAVE AVH COME

MANPRINT*PRIMARY=STOWAGE
Task=Other

Line of Comment	COMMENT
2	UP AND REMOVE AV OUT OF SHELTER BEFORE SHELTER CAN MOVE

MANPRINT*PRIMARY=V
Task=Other

Line of Comment	COMMENT
1	CAMOUFLAGE NET: TRIED SEVERAL LOCATIONS POSITION ON REAR WITH STRIP WO
2	RKS BEST. STORAGE NOT ORGANIZED JUST SHOVE THINGS IN. NEED TIE DWON S
3	PACE FOR PERSONAL GEAR. PERSONAL STUFF GETS WET. NEED EXTRA BOXES. PHO
4	NES NOW GET BEAT UP. NET MUST STAY DRY, BUT DON'T KNOW WHY. RIFLES STO
5	WAGE IN X PART A PROBLEM WITH 3 PEOPLE. NO PLACE OR TIED DWON FOR PERS
6	ONAL GEAR.

MANPRINT*PRIMARY=OTHER
Task=Other

Line of Comment	COMMENT
1	FLIGHT DURATION TOO SHORT; AUTO SEARCH IN EXCESS OF 10 KM TAKES TOO LO
2	NG; NOT SATISFIED WITH THE FUEL.

8.0 STRUCTURED INTERVIEW FINDINGS

8.1 Structured interviews were conducted with test participants to review topics related to the test data requirements. The data requirement number is provided for the appropriate items. Personnel of the supporting unit made comments in the structured interviews more freely than did other RPV test participants. The structured interview findings should be reviewed with findings in Section 7.0, Test Participants' Comments and Opinions. The interview items are listed in tables including:

a. Table 8.1.1. Supported Unit Headquarters, Supported Unit Interview

b. Table 8.1.2. Ground Control Station (GCS) CLRS and FCS Crew Interview

c. Table 8.1.3. Launch/Recovery Operator Interview

d. Table 8.1.4. Data Collector Interview

Table 8.1.1. Supported Unit Headquarters, Supported Unit Interview

1. (3.1.4) Is the Mission Orders Form format acceptable?

Yes = 9 No = 3 N.A. = 0

Comments: The mission order was developed by ICD personnel involved with the test. Yes, in its present form. Yes, the ICD developed and utilized its mission order. No, revised for OT II by 1st Cav Div. Yes, it is a short, concise, quick and understandable format. Needs to be shorter to include only key essential elements of information. Takes too much time to put together. It should be only a few lines in the Basic Operations Order.

2. (3.1.8) Were the C3I interface procedures between RPV and other units satisfactory?

Yes = 7 No = 4 N.A. = 1

Comments: The close face-to-face conditions between GCS and supported unit did not always occur. Not enough communications assets at the battery level. Work level at the battery often conflicted with interface communications. There were not enough radios to facilitate being on all nets necessary for good C3I. Generally, procedures were tactically sound. Hardwire must be maintained from FCS to Brigade TOC. It's more secure and cannot be jammed. The battery commander/1st SGT should interface more with the supported maneuver unit. Maintained frequent face-to-face coordination.

3. (3.1.8) Were the COMSEC procedures between RPV and other units satisfactory?

Yes = 8 No = 2 N.A. = 2

Comments: Lack of communications often forced the sending of vital information over clear nets. Battery often communicated in unciphered mode rather than through technical problem in cipher. We use wire between TOC and FCS at every location. The system must be green.

4. (3.4.8 & 3.4.9) Overall, were jamming countermeasures effective?

Yes = 4 No = 4 N.A. = 4

Comments: Alternate frequency employment. Jamming was very effective on FM commo. Standard procedures is to work through jamming and drop to alternate net should countermeasures fail. That was not carried out. Use of alternate frequencies. Did not experience any jamming during the test. Used wire commo links and avoiding FM commo from TOC to FCS.

5. (3.4.9) Did FM and data-link jamming adversely affect the ability of personnel to accomplish their mission?

Yes = 3 No = 6 N.A. = 3

Comments: When you can't talk to other element reporting what the air vehicle observes is impossible. The data-link jamming was not effective. The FM jamming was effective about 50% of the time. Forced unit/battery to communicate in clear voice transmission mode. We just changed frequencies. We were able to work through the jamming by using alternate nets and establishing wire communications.

6. (3.3.9) Was the compatibility between GCS and TACFIRE/BCS FM digital FM Communications links, supporting communications, COMSEC and operating procedures acceptable?

Yes = 4 No = 3 N.A. = 5

Comments: From operation view, TACFIRE could not produce results reports on target engagement. Need more FM equipment. RPV battery personnel needed training initially on radio telephone procedures (RTP). Couldn't tell: During the test, the battery did not transmit much data to Division TACFIRE. Digital links were sometimes inoperative. The GCS operators need more training in TACFIRE.

7. (3.3.12) Were GCS-computed burst corrections accurate and effective?

Yes = 3 No = 1 N.A. = 8

Comments: Overall yes, but there was a problem with gun target interface. We were not in the GCS to observe the spottings or corrections sent.

8. (3.3.19) Were the coordination and adjustment procedures used to conduct fire missions adequate?

Yes = 5 No = 2 N.A. = 5

Comments: Again, mission fire adjustments were not always performed accurately. Could use practice in the use of DMD and preplanned fire missions. They appeared adequate in the opinion of a non-artillery person. It appeared so as it only took one or two rounds before FFE was sent.

9. (3.1.22) Were the mission planning and CLRS/FCS procedures adequate?

Yes = 10 No = 1 N.A. = 1

Comments: Mission planning process was adequate to compel battery to fly the correct mission. The planning of the mission became very routine and speedy. The need to stop planning one mission and start planning the next based on intelligence was never really defined under continuous operations. Mission planning time was sufficient. CLRS/FCS was forwarded mission order early enough to prepare for

mission. Data was sent by OTEA so not much planning was needed. From our viewpoint, yes. From what we could hear on the FM, all was okay. Able to engage, as required. Maintained good coordination for both tactical and technical mission planning.

10. Were the FCS/CLRS coordination procedures for AV Launch and Handoff adequate?

Yes = 10 No = 2 N.A. = 0

Comments: Backup RGTs are apparently needed. Several RPVs ran out of fuel or into hours of near darkness due to loss of communications link. The technical procedures were acceptable. Information flow was often slow. Failing a first-time launch, the battery concentrated on firing and excluded attempting to launch another AV or use another launcher. No difficulties in coordination between FCS/ CLRS occurred, although handoff was sometimes not possible due to equipment malfunctions. Never had any problems in this area. No major problems from my observations. At times, the Mission Controllers would get into a discussion between themselves as to who was going to do what instead of me at the CLRS taking charge and stating what was going to happen.

11. (3.1.29) Was the FM communication between FCS and CLRS adequate for handoff procedures?

Yes = 10 No = 0 N.A. = 2

Comments: Generally, in most cases. Yes, as long as they have FM communications that do not interfere with the Division intelligence net. Yes, but need to establish who's in control, FCS or CLRS.

12. Generally, was the intelligence received as a result of the AV sorties useful and timely?

Yes = 8 No = 3 N.A. = 1

Comments: In most cases, the information received was sparse, inconclusive and insufficient due to the poor resolution of the monitor and generally lack of knowledge of equipment by RPV battery personnel. Often, the intelligence was hard to use because of the target representation on the ground. Example: Do three M113s equal a company, one vehicle and test equal a CP? The representation was not realistic, thus the information was confusing. Reports were frequent. Hard to tell as most, if not all, the targets were of the nature: Is it there or not? No way this test could relate as to the timeliness of the intel. What was seen was jammed. Generally, yes. Could not put the IPS together from what little information we received. Intel provided to DIVARTY was of limited value since most DIVARTY missions were firing on targets. Seeing one or two targets are good for targeting, but no enough for intelligence. There were not enough targets to adequately represent a Soviet maneuver unit. Against a real unit, there would be a large number of different targets. RPV operators need to be able to identify high payoff

targets. May want to use 96Ds or give additional imagery training to RPV operators. This is what the RPV should be used to target or find. Many times the intelligence was only one or two vehicle spot reports. Brigade level needs to know the "big picture."

13. (3.1.53) Is the current doctrine for intelligence transmission and reporting procedures during and after AV sorties adequate?

Yes = 8 No = 3 N.A. = 1

Comments: Need to use DMD for ATI more. RPV reporting of combat information should be accomplished by an LNO placed inside the CP of the supported unit. This would negate the overload of transmission on the intelligence net. Must use wire between TOC and FCS. The intelligence transmission and reporting procedures take up too much time on the O/I net. Operators need a detailed reporting criteria that they can follow. Camera resolution: hard to identify targets at recommended altitudes. You have to balance mission against survivability. Intelligence was timely, but consisted of small units (one/two). The RPV is a resource that needs to be oriented against second echelon forces. Mission orders combined too many different missions. Need to limit different missions per sorties. A force-on-force exercise should be tried to allow the RPV to locate, identify, report, and target enemy forces. Don't need to report every single type of vehicle (reporting criteria). Should add those into the TACFIRE ATI files to be passed up and acted upon. In a target-intense environment, the GCS would clog the air ways with intell - most of which may not be needed.

14. (3.4.14) Did communications problems exist which adversely affect command and control?

Yes = 8 No = 4 N.A. = 0

Comments: No more than usual during field operations. Overall, the battery did not possess enough commo equipment to talk to adjacent Headquarters. When equipment went down, there was no alternative for them to use. When the CLRS was not close enough to hardwire into DTAC commo, FM was the only means of communications. Due to lack of battery FM, they were limited on multiple net requirements. FM hardware maintenance, shortage of radios, improper secure model fills, ground disposition did not allow wire lines. From an airplane control perspective, this lack of direct communications with Fort Hood flight following to keep the ROZ unviolated made identifying violations difficult. Lack of 31Vs at all stations caused delays in solving problems. Lack of vehicle radios caused problems (i.e., many faulty radios). Jamming was a problem when FM commo was used at times. Wire is the answer. Need to have landline commo with the FCS at all times. Just standard commo problems; CEOI change and sometimes operator problems. This test was conducted with only the RPV program. In combat, there are too many units using the command and control nets, this may be a problem.

15. Were survey procedures adequate for CLRS equipment emplacements?

Yes = 5 No = 0 N.A. = 7

Comments: PADS maintenance is a systematic problem. Will not always be the case during combat situations. Always on time and up. Not to the degree desired. PADS error is 20 meters by 20 meters. RPV looked for one meter errors.

Table 8.1.2. Ground Control Station (GCS) CLRS and FCS Crew Interview

1. In your opinion, will RPV support you in the performance of the tasks necessary for successful completion of your mission?

   Yes = 14 No = 0 N.A. = 0

2. (3.1.4) Is the Mission Orders Form format acceptable?

   Yes = 10 No = 0 N.A. = 4

3. (3.1.7) Were there cases of mission orders sent by the supported unit headquarters but not received by the GCS?

   Yes = 1 No = 8 N.A. = 5

4. (3.1.8) Were the C3I interface procedures between RPV and other units satisfactory?

   Yes = 5 No = 2 N.A. = 7

5. (3.1.8) Were the COMSEC procedures between RPV and other units satisfactory?

   Yes = 8 No = 2 N.A. = 4

6. (3.1.10) Were there situations where missions were not flown within 30 minutes of the time indicated on the Mission Order?

   Yes = 14 No = 0 N.A. = 0

7. (3.1.13) Were there modifications or cancellations of Mission Orders received by the GCS?

   Yes = 10 No = 0 N.A. = 4

8. (3.1.10) Were procedures used to set priorities for multiple mission orders for RPV support?

   Yes = 4 No = 1 N.A. = 9

9. (3.1.14) Were problems encountered planning AV flights to accomplish the tasks outlined on the Mission Orders?

   Yes = 7 No = 2 N.A. = 5

10. (3.1.16) Were any problems encountered during mission planning while wearing MOPP 2 and MOPP 4 gear?

    Yes = 5 No = 6 N.A. = 3

11. Were the data-link anti-jam mode settings effective overall?

Yes = 11 No = 0 N.A. = 3

12. (3.4.3) Was there an effect of the anti-jamming mode settings on video resolution?

Yes = 11 No = 1 N.A. = 2

13. (3.4.6) Did jamming during coordination for launch and handoff operations have an adverse effect on these operations?

Yes = 3 No = 8 N.A. = 3

14. (3.4.8 & 3.4.9) Overall, were jamming countermeasures effective?

Yes = 7 No = 2 N.A. = 5

15. (3.4.9) Did FM and data-link jamming adversely affect the ability of personnel to accomplish their mission?

Yes = 6 No = 5 N.A. = 3

16. (3.3.9) Was the compatibility between GCS and TACFIRE/BCS FM digital FM Communications links, supporting communications, COMSEC and operating procedures acceptable?

Yes = 7 No = 3 N.A. = 4

17. (3.3.12) Were GCS-computed burst corrections accurate and effective?

Yes = 12 No = 0 N.A. = 2

18. (3.3.15) Was the target engagement guidance provided by the supported unit adequate to accomplish your mission?

Yes = 10 No = 2 N.A. = 2

19. (3.3.19) Were the coordination and adjustment procedures used to conduct fire missions adequate?

Yes = 12 No = 1 N.A. = 1

20. (3.3.20) Did the autotracker perform adequately during conduct of fire missions?

Yes = 11 No = 0 N.A. = 3

21. Were recovery procedures used for the test adequate for successful mission performance?

Yes = 8 No = 1 N.A. = 5

22. (3.1.20) Was it easy to enter information from the mission planning worksheet into the GCS computer in terms of adequacy of disk storage, computer rejection of illegal inputs, or computer failure to reject illegal inputs?

Yes = 7 No = 1 N.A. = 6

23. (3.1.22) Were the mission planning and CLRS/FCS procedures adequate?

Yes = 10 No = 0 N.A. = 4

24. Were the FCS/CLRS coordination procedures for AV Launch and Handoff adequate?

Yes = 12 No = 0 N.A. = 2

25. (3.1.31) Were GCS procedures and AV maneuvers adequate to accomplish the handoff function?

Yes = 13 No = 0 N.A. = 1

26. (3.1.29 & 3.1.39) Was the FM communication between FCS and CLRS adequate for handoff procedures?

Yes = 12 No = 1 N.A. = 1

27. (3.1.47) Generally, did lost links make the remainder of the AV sortie ineffective?

Yes = 4 No = 7 N.A. = 3

28. (3.1.50) Generally, were the procedures used to overcome emergency in-flight problems such as lost link adequate?

Yes = 13 No = 0 N.A. = 1

29. Generally, was the intelligence received as a result of the AV sorties useful and timely?

Yes = 11 No = 0 N.A. = 3

30. (3.1.53) Is the current doctrine for intelligence transmission and reporting procedures during and after AV sorties adequate?

Yes = 7 No = 0 N.A. = 7

31. (3.1.54) Did illegal inputs (excessive climb, dive, turn, and speed rates) harm the rest of the AV flight program?

Yes = 0 No = 8 N.A. = 6

32. Does the RPV have adequate ability to measure ground truth?

Yes = 10 No = 1 N.A. = 3

33. (3.4.14) Did communications problems exist which adversely affect command and control?

Yes = 9 No = 3 N.A. = 2

34. (3.4.15) Were personnel able to effectively perform command and control communications functions in MOPP 2 gear?

Yes = 12 No = 0 N.A. = 2

35. (3.4.15) Were personnel able to effectively perform command and control communications functions in MOPP 4 gear?

Yes = 7 No = 4 N.A. = 3

36. Were survey procedures adequate for GCS emplacement?

Yes = 9 No = 1 N.A. = 4

37. (3.4.23) Were there any particular emplacement/displacement actions that caused delays?

Yes = 6 No = 7 N.A. = 1

38. (3.4.37) Can any four (randomly selected) personnel who can hold the 13T MOS carry a ready-to-fly AV 20 feet over rolling terrain?

Yes = 9 No = 3 N.A. = 2

39. (3.4.38) Can RPV personnel effectively perform emplacement/displacement duties in MOPP 2 & 4 gear?

Yes = 12 No = 2 N.A. = 0

40. (3.4.39) Are there any problems associated with camouflaging the different RPV vehicles or equipment?

Yes = 7 No = 7 N.A. = 0

41. (3.4.40) Were battery/section command and control, reconnaissance, selection and occupation procedures adequate?

Yes = 10 No = 0 N.A. = 4

42. (3.4.47) Did the modular collective protective equipment (MCPE) function adequately?

Yes = 2 No = 1 N.A. = 11

43. (3.4.48) Were any problems experienced with decontaminating battery equipment?

Yes = 4 No = 7 N.A. = 3

44. Are the RPV vehicles and equipment vulnerable to small arms and indirect fire weapons?

Yes = 13 No = 0 N.A. = 1

45. Can the RPV vehicles and equipment be decontaminated with organic and support decontamination equipment?

Yes = 6 No = 2 N.A. = 6

46. (3.4.72) Were adequate alternative diagnostic procedures available when BITE/TMDE was not?

Yes = 3 No = 1 N.A. = 10

47. (3.4.84) Are POL and maintenance recovery capabilities adequate for mission performance?

Yes = 10 No = 4 N.A. = 0

48. (3.4.73) Were the maintenance authorizations and organizations adequate?

Yes = 9 No = 4 N.A. = 1

49. (3.4.84) Is the battery able to coordinate and obtain all needed supplies for widely separated RPV sections during field deployment?

Yes = 9 No = 4 N.A. = 1

50. (3.4.87) Is the current assignment strategy of supply and maintenance personnel adequate for effective mission performance?

Yes = 6 No = 3 N.A. = 5

51. Are common and special tools supplied with RPV equipment adequate for effective mission performance?

Yes = 8 No = 3 N.A. = 3

52. Is TMDE and Calibration equipment for RPV adequate?

Yes = 2 No = 1 N.A. = 11

53. (3.4.75 & 3.4.88) Do the TMs have adequate logistics support procedures documentation?

Yes = 4 No = 4 N.A. = 6

54. (3.4.80) Overall, are RPV parts easy to remove, repair and replace?

Yes = 8 No = 1 N.A. = 5

55. (3.4.84) In the proposed RPV system, are all classes of supply available at the proper echelons?

Yes = 3 No = 2 N.A. = 9

56. Were the training aids used during RPV training adequate?

Yes = 8 No = 5 N.A. = 1

57. Were the training devices used during RPV training adequate?

Yes = 9 No = 3 N.A. = 2

58. In your opinion, are there any items of environment such as illumination, noise, ventilation, temperature, vibration, and climate that pose a potential problem for RPV operators?

Yes = 7 No = 6 N.A. = 1

59. Is it easy to look up or locate information related to a specific problem in the technical manual (TM)?

Yes = 4 No = 6 N.A. = 4

60. Is the TM sufficiently small and rugged that it can be carried and stowed under operational conditions with a minimum of difficulty or damage (lost pages, etc.)?

Yes = 2 No = 11 N.A. = 1

61. Are there any other problems you've encountered with the TM? Your recommended solutions and improvements would be appreciated.

Yes = 3 No = 7 N.A. = 4

62. Do you feel there should be more classroom training?

Yes = 3 No = 9 N.A. = 2

63. Do you feel there should be more collective (unit) training?

Yes = 5 No = 9 N.A. = 0

64. (3.4.91) Have you observed any other training problems which you feel are important?

Yes = 10 No = 4 N.A. = 0

65. Were the Skill Performance Aids effective in assisting successful task performance?

Yes = 6 No = 0 N.A. = 8

66. (3.4.92) In your opinion, can 90% of the soldiers perform 90% of the RPV related SQT tasks?

Yes = 5 No = 8 N.A. = 1

67. (3.4.97) Have you or others identified critical tasks that were not included in training?

Yes = 7 No = 7 N.A. = 0

68. Are there ARTEP tasks that the battery is unable to perform to standards? If so, please specify.

Yes = 0 No = 9 N.A. = 5

69. Are there any other individual or collective performance deficiencies that were not corrected by additional training and/or time?

Yes = 1 No = 12 N.A. = 1

70. (3.4.104) Have you observed or are you aware of ARTEP tasks degraded or not completed in a training environment due to safety or health considerations related to the operations of RPV vehicles and equipment?

Yes = 3 No = 10 N.A. = 1

The design of the RPV equipment should support the users ability to interact with the system, and enable the operators to perform the tasks required by the system. Is the system designed "right" for you?

AIR VEHICLE CONSOLE AND PANELS

GDT Controls/Displays

71. Controls are within functional reach

Yes = 9 No = 3 N.A. = 2

72. Controls are grouped functionally

Yes = 10 No = 2 N.A. = 2

73. Labels and codes are readable and understandable

Yes = 12 No = 0 N.A. = 2

74. Displays are readable

Yes = 12 No = 0 N.A. = 2

75. Lighting is sufficient during all conditions

Yes = 11 No = 2 N.A. = 1

76. Equipment status information is available and understandable

Yes = 10 No = 2 N.A. = 2

77. Operational interfaces between this and other equipment is consistent

Yes = 10 No = 1 N.A. = 3

Communications Panel

78. Controls are within functional reach

Yes = 14 No = 0 N.A. = 0

79. Controls are grouped functionally

Yes = 14 No = 0 N.A. = 0

80. Labels and codes are readable and understandable

Yes = 14 No = 0 N.A. = 0

81. Displays are readable

Yes = 14 No = 0 N.A. = 0

82. Lighting is sufficient during all conditions

Yes = 13 No = 1 N.A. = 0

83. Equipment status information is available and understandable

Yes = 14 No = 0 N.A. = 0

84. Operational interfaces between this and other equipment is consistent

Yes = 12 No = 2 N.A. = 0

Air Vehicle Control/Display Panel

85. Controls are within functional reach

Yes = 10 No = 0 N.A. = 4

86. Controls are grouped functionally

Yes = 10 No = 0 N.A. = 4

87. Labels and codes are readable and understandable

Yes = 10 No = 0 N.A. = 4

88. Displays are readable

Yes = 10 No = 0 N.A. = 4

89. Lighting is sufficient during all conditions

Yes = 10 No = 0 N.A. = 4

90. Equipment status information is available and understandable

Yes = 10 No = 0 N.A. = 4

91. Controls are prevented from accidental operation

Yes = 10 No = 0 N.A. = 4

Video Monitor

92. Display resolution is adequate for target acquisition and identification

Yes = 7 No = 4 N.A. = 3

93. Text messages are readable and understandable

Yes = 10 No = 1 N.A. = 3

94. Lighting is sufficient during all conditions

Yes = 10 No = 1 N.A. = 3

95. Operation does not interfere with the Air Vehicle Control Panel

Yes = 10 No = 1 N.A. = 3

MISSION PAYLOAD OPERATOR CONSOLE

Communications Panel

96. Controls are within functional reach

Yes = 13 No = 0 N.A. = 1

97. Controls are grouped functionally

Yes = 13 No = 0 N.A. = 1

98. Labels and codes are readable and understandable

Yes = 13 No = 0 N.A. = 1

99. Displays are readable

Yes = 13 No = 0 N.A. = 1

100. Lighting is sufficient during all conditions

Yes = 13 No = 0 N.A. = 1

101. Equipment status information is available and understandable

Yes = 13 No = 0 N.A. = 1

102. Operational interfaces between this and other equipment is consistent

Yes = 12 No = 1 N.A. = 1

Comments: Laser firing button should be placed on the left side of the panel. They need to move the "fire laser" button.

Video Monitor

103. Display resolution is adequate for target acquisition and identification

Yes = 6 No = 6 N.A. = 2

104. Text messages are readable and understandable

Yes = 8 No = 0 N.A. = 6

105. Lighting is sufficient during all conditions

Yes = 12 No = 0 N.A. = 2

106. Operation does not interfere with the Air Vehicle Control Panel

Yes = 10 No = 1 N.A. = 3

Comments: Target detect is poor on black and white monitor. Video is very poor as related to locating stationary targets. The video from the AV has at times been degraded, however it has never been to the point where you could not do the mission. Since the rate step function has been implemented, it is easier to locate and adjust targets in different AJ modes. On overcast days, it is excellent; but on sunny days, EW have problems with glare off of ponds, lakes, rivers and sometimes off the payload itself. Targets under camouflage nets are hard to detect. Video for moving or stationary targets in the open is OK. Targets under camouflage are very hard to detect. At approximately 1200-1500, when sun is at highest point, identifying vehicles is difficult, although you can detect them in zoom on the quality of target image is very poor. I personally think that a color monitor would help in detecting targets. Some angles of the sun cause great resolution problems with this type of display.

Mission Payload Control/Display Panel

107. Controls are within functional reach

Yes = 12 No = 1 N.A. = 1

108. Controls are grouped functionally

Yes = 13 No = 0 N.A. = 1

109. Labels and codes are readable and understandable

Yes = 13 No = 0 N.A. = 1

110. Displays are readable

Yes = 13 No = 0 N.A. = 1

111. Lighting is sufficient during all conditions

Yes = 13 No = 0 N.A. = 1

112. Equipment status information is available and understandable

Yes = 13 No = 0 N.A. = 1

113. Operational interfaces between this and other equipment is consistent

Yes = 13 No = 0 N.A. = 1

Comments: Laser fire button is misplaced. Put fire button on joystick. Also joystick is too sensitive. Must move "fire laser" button.

MISSION COMMANDER CONSOLE

Video Tape Recorder

114. Controls are within functional reach

Yes = 7 No = 3 N.A. = 4

115. Labels and codes are readable and understandable

Yes = 7 No = 3 N.A. = 4

116. Displays are readable

Yes = 7 No = 2 N.A. = 5

117. Lighting is sufficient during all conditions

Yes = 8 No = 2 N.A. = 4

118. Equipment status information is available and understandable

Yes = 6 No = 1 N.A. = 7

Comments: Video controls are not adequate. Must stand up to see what button to push. Video tape recorder controls located in terrible place, making it hard to reach and read. You do not get equipment status update on the MC console.

Communications Panel

119. Controls are within functional reach

Yes = 9 No = 1 N.A. = 4

120. Controls are grouped functionally

Yes = 10 No = 0 N.A. = 4

121. Labels and codes are readable and understandable

Yes = 10 No = 0 N.A. = 4

122. Displays are readable

Yes = 10 No = 0 N.A. = 4

123. Lighting is sufficient during all conditions

Yes = 10 No = 0 N.A. = 4

124. Equipment status information is available and understandable

Yes = 10 No = 0 N.A. = 4

125. Operational interfaces between this and other equipment is consistent

Yes = 9 No = 1 N.A. = 4

Video Monitor

126. Display resolution is adequate for target acquisition and identification

Yes = 6 No = 3 N.A. = 5

Comments: Ground illumination problems.

127. Text messages are readable and understandable

Yes = 8 No = 0 N.A. = 6

128. Lighting is sufficient during all conditions

Yes = 9 No = 0 N.A. = 5

129. Operation does not interfere with the Air Vehicle Control Panel

Yes = 9 No = 0 N.A. = 5

Mission Control/Display Panel

130. Controls are within functional reach

Yes = 10 No = 0 N.A. = 4

131. Controls are grouped functionally

Yes = 10 No = 0 N.A. = 4

132. Labels and codes are readable and understandable

Yes = 10 No = 0 N.A. = 4

133. Displays are readable

Yes = 10 No = 0 N.A. = 4

134. Display resolution is adequate

Yes = 9 No = 0 N.A. = 5

135. Lighting is sufficient during all conditions

Yes = 9 No = 0 N.A. = 5

136. Equipment status information is available and understandable

Yes = 8 No = 1 N.A. = 5

137. Text and data input from the keyboard is accomplished efficiently

Yes = 9 No = 0 N.A. = 5

Comments: Ground illumination problems.

GENERAL

138. Is the working space in the GCS adequate for you and other GCS team members to perform your respective tasks at all times during operations?

Yes = 5 No = 9 N.A. = 0

Comments: With radios where they are, can't set frequency easily. Not enough room to move around. Radio rack could be stood up. Too

narrow improvements on spacing need. Crowded at A.V.O.C. and commo rack. Where the I/U is, the AVO has to move around the MPO working on the MIM or commo rack. At times, it gets kind of tight. If the VIPs and data collectors would get out. Communication rack is in the way. It is hard to set behind teleprinter and people walk behind. GCS is too thin, controls should be swapped and teleprinter moved.

139. Are there items of environment such as noise, temperature, vibration, illumination or climate that pose a potential problem for GCS team members?

Yes = 9 No = 4 N.A. = 1

Comments: Noise and light bad. Noise, need blackout lights when door open. Noise and smoke around 30 kw generators. No problems. Claustrophobia. Noise. Climate, noise.

140. Are there particular operations of the GCS that pose a safety hazard to GCS team members?

Yes = 6 No = 7 N.A. = 1

Comments: Getting on the front of GCS to hook up power cables is dangerous. Video hurts eyes after long period of time. MCPE control box in a bad place. No problems. Camouflage. The antennas while camouflaging. Hearing.

SAFETY

Have you or others observed potential or actual safety hazards that could result in shock, burns, falls, cuts, bruises, explosions, entanglements in moving parts, strains due to lifting or handling, or other injuries? Please consider all situations when the equipment will be operated: at night; with MOPP gear; in rain or snow; in heat, etc. Also consider all aspects of the equipments' operation: movement from site to site; site setup; preparation for mission; actual mission operation, and site breakdown.

Please answer for each equipment component.

GCS

141. Mission Payload Console

Yes = 0 No = 14 N.A. = 0

142. Mission Commander Console

Yes = 0 No = 14 N.A. = 0

143. Mission Planning Facility

Yes = 0 No = 14 N.A. = 0

144. Computer Suite

Yes = 0 No = 14 N.A. = 0

145. Communications Panels

Yes = 0 No = 14 N.A. = 0

146. Modular Collective Protection Equipment

Yes = 1 No = 13 N.A. = 0

147. Power Supply Panels

Yes = 1 No = 12 N.A. = 1

148. Ground Support Equipment

Yes = 2 No = 11 N.A. = 1

Comments: All are very bad in MOPP 4, but the MCPE is the worst to try to assemble with MOPP 4. Falls during camouflage.

REMOTE GROUND TERMINAL

149. Antenna

Yes = 3 No = 11 N.A. = 0

150. Batteries

Yes = 0 No = 14 N.A. = 0

151. Power Panels

Yes = 0 No = 14 N.A. = 0

152. Control Panels

Yes = 1 No = 13 N.A. = 0

153. Power Generator

Yes = 2 No = 12 N.A. = 0

Comments: Generators are often lifted or carried by one operator. Shack. Heavy generators.

154. Have you or others received any injuries during the conduct of this test while operating RPV equipment? Please describe what you were working on and what caused the injury.

Yes = 8 No = 6 N.A. = 0

Comments: Two men fell and were injured during night operations, hooking up cables on GCS. Two individuals put their thumbs between the shuttle latch and micro switch, which resulted in injury to both thumbs. Pulled back muscles. I haven't, however, others have. Injured backs while carrying F.O. reels or generators. Broken ribs from slipping off vehicle while camouflaging, injured shoulder while installing power cable at GCS, smashed thumbs while repairing micro switch at launcher are some of the injuries that have occurred.

Table 8.1.3. Launch/Recovery Operator Interview

1. In your opinion, will RPV support you in the performance of the tasks necessary for successful completion of your mission?

   Yes = 6   No = 2   N.A. = 2

2. (3.1.8) Were the C3I interface procedures between RPV and other units satisfactory?

   Yes = 5   No = 0   N.A. = 5

3. (3.1.8) Were the COMSEC procedures between RPV and other units satisfactory?

   Yes = 3   No = 1   N.A. = 6

4. Were recovery procedures used for the test adequate for successful mission performance?

   Yes = 5   No = 5   N.A. = 0

5. (3.1.31) Were the FCS/CLRS coordination procedures for AV Launch and Handoff adequate?

   Yes = 4   No = 0   N.A. = 6

6. Were survey procedures adequate for GCS emplacement?

   Yes = 3   No = 0   N.A. = 7

7. (3.4.28 & 3.4.31 & 3.4.34) Were there any particular emplacement/displacement actions that caused delays?

   Yes = 9   No = 1   N.A. = 0

8. (3.4.37) Can any four (randomly selected) personnel who can hold the 13T MOS carry a ready-to-fly AV 20 feet over rolling terrain?

   Yes = 6   No = 4   N.A. = 0

9. (3.4.38) Can RPV personnel effectively perform emplacement/displacement duties in MOPP 2 & 4 gear?

   Yes = 5   No = 5   N.A. = 0

10. (3.4.39) Are there any problems associated with camouflaging the different RPV vehicles or equipment?

   Yes = 5   No = 5   N.A. = 0

11. (3.4.40) Were battery/section command and control, reconnaissance, selection and occupation procedures adequate?

Yes = 1 No = 6 N.A. = 3

12. (3.4.48) Were any problems experienced with decontaminating battery equipment?

Yes = 2 No = 3 N.A. = 5

13. (3.4.49) Are the RPV vehicles and equipment easy to camouflage or conceal?

Yes = 3 No = 7 N.A. = 0

14. Are the RPV vehicles and equipment vulnerable to small arms and indirect fire weapons?

Yes = 9 No = 0 N.A. = 1

15. Can the RPV vehicles and equipment be decontaminated with organic and support decontamination equipment?

Yes = 3 No = 1 N.A. = 6

16. (3.4.72) Were adequate alternative diagnostic procedures available when BITE/TMDE was not?

Yes = 1 No = 1 N.A. = 8

17. (3.4.84) Are POL and maintenance recovery capabilities adequate for mission performance?

Yes = 3 No = 3 N.A. = 4

18. (3.4.84) Is the battery able to coordinate and obtain all needed classes of supply for widely separated RPV sections during field deployment?

Yes = 1 No = 6 N.A. = 3

19. (3.4.87) Is the current assignment strategy of supply and maintenance personnel adequate for effective mission performance?

Yes = 1 No = 9 N.A. = 0

20. Are common and special tools supplied with RPV equipment adequate for effective mission performance?

Yes = 5 No = 5 N.A. = 0

21. Is TMDE and Calibration equipment for RPV adequate?

Yes = 2 No = 0 N.A. = 8

22. (3.4.75 & 3.4.88) Do the TMs have adequate logistics support procedures documentation?

Yes = 3 No = 1 N.A. = 6

23. (3.4.80) Overall, are RPV parts easy to remove, repair and replace?

Yes = 3 No = 4 N.A. = 3

24. (3.4.84) In the proposed RPV system, are all classes of supply available at the proper echelons?

Yes = 2 No = 4 N.A. = 4

25. Were the training aids used during RPV training adequate?

Yes = 4 No = 5 N.A. = 1

26. Were the training devices used during RPV training adequate?

Yes = 7 No = 2 N.A. = 1

27. In your opinion, are there any items of environment such as illumination, noise, ventilation, temperature, vibration, and climate that pose a potential problem for RPV operators?

Yes = 10 No = 0 N.A. = 0

28. Is the information in the RPV Technical Manuals presented clearly?

Yes = 4 No = 2 N.A. = 4

29. Is it easy to look up or locate information related to a specific problem in the technical manual (TM)?

Yes = 3 No = 3 N.A. = 4

30. Is the TM sufficiently small and rugged that it can be carried and stowed under operational conditions with a minimum of difficulty or damage (lost pages, etc.)?

Yes = 1 No = 6 N.A. = 3

31. Are there any other problems you've encountered with the TM?

Yes = 1 No = 3 N.A. = 6

32. Do you feel there should be more classroom training?

Yes = 0 No = 10 N.A. = 0

33. Do you feel there should be more collective (unit) training?

Yes = 2 No = 7 N.A. = 1

34. (3.4.91) Have you observed any other training problems which you feel are important?

Yes = 6 No = 3 N.A. = 1

35. Were the Skill Performance Aids adequate in assisting successful task performance?

Yes = 7 No = 1 N.A. = 2

36. (3.4.92) In your opinion, can 90% of the soldiers perform 90% of the RPV related SQT tasks? (assume correct MOS)

Yes = 1 No = 7 N.A. = 2

37. (3.4.97) Have you or others identified critical tasks that were not included in training?

Yes = 2 No = 5 N.A. = 3

38. Are there ARTEP tasks that the battery is unable to perform to standards?

Yes = 2 No = 2 N.A. = 6

39. (3.4.98) Are there any other individual or collective performance deficiencies that were not corrected by additional training and/or time?

Yes = 1 No = 4 N.A. = 5

The design of the RPV equipment should support the users ability to interact with the system, and enable the operators to perform the tasks required by the system. Is the system designed "right" for you?

REMOTE GROUND TERMINAL

Remote Control Unit

40. The unit can be operated efficiently while using the sight?

Yes = 7 No = 0 N.A. = 3

41. Controls are within functional reach?

Yes = 7 No = 0 N.A. = 3

42. Labels and codes are readable and understandable?

Yes = 6 No = 0 N.A. = 4

43. Lighting is sufficient during all conditions?

Yes = 2 No = 5 N.A. = 3

Ground Terminal Circuit Breaker

44. Controls are within functional reach?

Yes = 7 No = 0 N.A. = 3

45. Controls are grouped functionally?

Yes = 7 No = 0 N.A. = 3

46. Lighting is sufficient during all conditions?

Yes = 4 No = 3 N.A. = 3

Ground Terminal Main Power Panel

47. Controls are within functional reach?

Yes = 7 No = 0 N.A. = 3

48. Controls are grouped functionally?

Yes = 7 No = 0 N.A. = 3

49. Lighting is sufficient during all conditions?

Yes = 6 No = 1 N.A. = 3

50. Traveling and blast legs can be set efficiently?

Yes = 6 No = 1 N.A. = 3

LAUNCH VEHICLE

Launch Command Module

51. Controls are within functional reach?

Yes = 10 No = 0 N.A. = 0

52. Controls are grouped functionally?

Yes = 10 No = 0 N.A. = 0

53. Labels and codes are readable and understandable?

Yes = 10 No = 0 N.A. = 0

54. Displays are readable?

Yes = 10 No = 0 N.A. = 0

55. Lighting is sufficient during all conditions?

Yes = 7 No = 3 N.A. = 0

56. Equipment status information is available and understandable?

Yes = 9 No = 0 N.A. = 1

Launch Control Panel

57. Controls are within functional reach?

Yes = 10 No = 0 N.A. = 0

58. Controls are grouped functionally?

Yes = 10 No = 0 N.A. = 0

59. Labels and codes are readable and understandable?

Yes = 10 No = 0 N.A. = 0

60. Displays are readable?

Yes = 10 No = 0 N.A. = 0

61. Lighting is sufficient during all conditions?

Yes = 8 No = 2 N.A. = 0

62. Equipment status information is available and understandable?

Yes = 9 No = 0 N.A. = 1

MICNS and GDT Initializers

63. Controls are within functional reach?

Yes = 9 No = 0 N.A. = 1

64. Labels and codes are readable and understandable?

Yes = 9 No = 0 N.A. = 1

65. Displays are readable?

Yes = 9 No = 0 N.A. = 1

66. Lighting is sufficient during all conditions?

Yes = 9 No = 0 N.A. = 1

67. Equipment status information is available and understandable?

Yes = 9 No = 0 N.A. = 1

68. Keyboard entry can be done efficiently?

Yes = 9 No = 0 N.A. = 1

Air Vehicle Loader

69. Controls are within functional reach?

Yes = 8 No = 2 N.A. = 0

70. Labels and codes are readable and understandable?

Yes = 6 No = 4 N.A. = 0

71. Lighting is sufficient during all conditions?

Yes = 4 No = 5 N.A. = 1

72. The hydraulic hand pump can be operated without over-exertion?

Yes = 5 No = 4 N.A. = 1

73. The control action allows smooth and precise operation of the loader?

Yes = 7 No = 3 N.A. = 0

RECOVERY VEHICLE

Support Structure Control Assembly

74. Controls are within functional reach?

Yes = 10 No = 0 N.A. = 0

75. Labels and codes are readable and understandable?

Yes = 10 No = 0 N.A. = 0

76. Lighting is sufficient during all conditions?

Yes = 6 No = 4 N.A. = 0

77. The control action allows smooth and precise operation of the net structure?

Yes = 7 No = 3 N.A. = 0

Signal Processing Assembly

78. Labels and codes are readable and understandable?

Yes = 8 No = 1 N.A. = 1

79. Displays are readable?

Yes = 9 No = 0 N.A. = 1

80. Lighting is sufficient during all conditions?

Yes = 6 No = 2 N.A. = 2

81. Equipment status information is available and understandable?

Yes = 9 No = 0 N.A. = 1

Recovery Guidance Aid Control Unit

82. Controls are within functional reach?

Yes = 10 No = 0 N.A. = 0

83. Labels and codes are readable and understandable?

Yes = 9 No = 1 N.A. = 0

84. Displays are readable?

Yes = 9 No = 1 N.A. = 0

85. Lighting is sufficient during all conditions?

Yes = 6 No = 3 N.A. = 1

86. Equipment status information is available and understandable?

Yes = 10 No = 0 N.A. = 0

87. Keyboard entry can be done efficiently?

Yes = 7 No = 2 N.A. = 1

AIR VEHICLE MOBILE CRANE TRUCK

Remote Controller

88. Controls are within functional reach?

Yes = 7 No = 3 N.A. = 0

89. Controls are grouped functionally?

Yes = 10 No = 0 N.A. = 0

90. Labels and codes are readable and understandable?

Yes = 6 No = 3 N.A. = 1

91. Lighting is sufficient during all conditions?

Yes = 4 No = 6 N.A. = 0

92. Equipment status information is available and understandable?

Yes = 7 No = 1 N.A. = 2

93. Control allows smooth and precise crane operation?

Yes = 6 No = 4 N.A. = 0

94. The Air Vehicle Container allows quick and effective attachment for cover removal, container loading and unloading?

Yes = 3 No = 7 N.A. = 0

95. The Air Vehicle Recovery Harness allows quick and effective attachment to the AV for retrieval from the recovery net?

Yes = 5 No = 5 N.A. = 0

96. The Air Vehicle Fuel Servicing Unit can be quickly and effectively moved and operated?

Yes = 1 No = 9 N.A. = 0

SAFETY

Have you or others observed potential or actual safety hazards that could result in shock, burns, falls, cuts, bruises, explosions, entanglements in moving parts, strains due to lifting or handling, or other injuries? Please consider all situations when the equipment will be operated: at night; with MOPP gear; in rain or snow; in heat, etc. Also consider all aspects of the equipments' operation: movement from site to site; site setup; preparation for mission; actual mission operation; and site breakdown.

Please answer for each equipment component.

AIR VEHICLE MOBILE CRANE

97. AV Container

Yes = 7 No = 3 N.A. = 0

98. AV Fuel Servicing Unit

Yes = 8 No = 2 N.A. = 0

99. Boarding Ladders

Yes = 3 No = 7 N.A. = 0

100. AV Crane

Yes = 7 No = 3 N.A. = 0

Comments: Crane can hit personnel. Crane base covers are flimsy hydraulic lines could be entangled in gears.

101. AV Recovery Harness

Yes = 2 No = 8 N.A. = 0

Comments: Recovery harness not strong enough to support AV properly.

102. AV Hoisting Fixture

Yes = 3 No = 7 N.A. = 0

Comments: If the lid falls on you. If you have someone that doesn't know what they are doing someone could get hurt. Sometimes leaks fuel fire hazard. When used at night, sometimes poor visibility. AV hoisting mixture can snag personnel. The latches have caused countless scrapped hands and knuckles. Pressure can cause lid to pop off. Latches; leakage of fuel; fast rotation. Retaining pins have lanyards crimped from them to the equipment. There is no means to repair the lanyard causing the loss of pins.

LAUNCHER

103. AV Starter

Yes = 1 No = 8 N.A. = 1

104. Shuttle

Yes = 5 No = 3 N.A. = 2

Comments: When it goes forward, it jerks and moves unpredictably. AV shuttle if hold back bar lets loose can kill.

105. Guide Rail Assembly

Yes = 1 No = 7 N.A. = 2

106. AV Loader

Yes = 2 No = 7 N.A. = 1

Comments: AV loader over strenuous. Men are moving on the pallet when AV loader is being stowed. I have suffered numerous scrapes, bruises, and cuts from the stowage bracket.

107. Railfold Actuator

Yes = 1 No = 7 N.A. = 2

Comments: Railfold actuator can pinch.

108. Power Panels

Yes = 0 No = 7 N.A. = 3

109. Hydraulic System

Yes = 2 No = 6 N.A. = 2

Comments: On the launcher, there are all sorts of safety problems you need to watch for. When released while behind 2) if on launcher after cylinder is pressurized or while retrieving. Hydraulic system can kill if ruptured.

RECOVERY VEHICLE

110. Recovery Net

Yes = 0 No = 8 N.A. = 2

111. Net Support Structure

Yes = 5 No = 4 N.A. = 1

Comments: Slippery. Sheer size makes it a hazard. When wet, this is very hazardous because one runs a risk of slipping and falling. It can get very slippery. Suggestion: Grip tape would be very useful. Too slick-wet or snow or mud or oil.

112. Decelerator

Yes = 0 No = 9 N.A. = 1

113. Operator Stand

Yes = 1 No = 8 N.A. = 1

Comments: Actuator rupture will kill operator.2

114. Power Distribution

Yes = 2 No = 7 N.A. = 1

Comments: If done wrong. Hydraulic line a potential hazard.

AIR VEHICLE

115. Engine

Yes = 4 No = 5 N.A. = 1

Comments: It's too loud. Engine is too loud. Hearing engine is extremely loud and personnel are exposed continually.

116. Fuel System

Yes = 3 No = 6 N.A. = 1

117. Electrical System

Yes = 0 No = 9 N.A. = 1

Comments: Could shear a propeller/fuel in your eyes/if lasing and crew isn't told about it.

118. Mission Payload

Yes = 3 No = 6 N.A. = 1

Comments: During launch sequence, the laser can accidentally be fired, it has happened. Payload could shoot laser in my eyes.

REMOTE GROUND TERMINAL

119. Antenna

Yes = 5 No = 4 N.A. = 1

Comments: It could make you sterile. Antenna could irradiate and sterilize. Even with two men, it still provides a hazard to lift.

120. Batteries

Yes = 0 No = 9 N.A. = 1

121. Power Panels

Yes = 0 No = 9 N.A. = 1

122. Control Panels

Yes = 0 No = 9 N.A. = 1

123. Power Generator

Yes = 1 No = 8 N.A. = 1

124. Have you or others received any injuries during the conduct of this test while operating RPV equipment? Please describe what you were working on and what caused the injury.

Yes = 6 No = 3 N.A. = 1

Comments: Everybody that worked in LS/RS got hurt one way or another on different equipment. Some fell off the trucks. Two people got their thumbs broken by the launcher. Everyone who has opened a container lid has busted a knuckle off. I was removing OVM tools for grounding when the LS emergency brake system failed and truck moved back, pinning me between LS and AVH. FSU - when defueling an AV, the pressure caused the lid to pop off getting fuel in my eyes. RCVY - while putting on the net, I slipped on the barrier structure (it was wet) and fell. When I was removing the net after a recovery then #10 hit me in the head, although I was wearing a helmet and the control operator wasn't paying attention, I was still knocked senseless. Lifting 1.5 kw gen onto RGT and it fell off causing strain and pulled ligaments in my arm when I caught it. Scratches, crevices with sharp edges in LS/RS. Ballistic shield in launcher.

Table 8.1.4. Data Collector Interview

1. In your opinion, will RPV support you in the completion of the tasks necessary for successful completion of your mission?

Day:	Yes = 11	No = 2	N.A. = 5
Night:	Yes = 11	No = 4	N.A. = 1

2. (3.1.4) Is the Mission Orders Form format acceptable?

Day:	Yes = 6	No = 0	N.A. = 12
Night:	Yes = 8	No = 0	N.A. = 8

3. (3.1.7) Do you know of cases of mission orders being sent by the supported unit headquarters but not received by the GCS?

Day:	Yes = 0	No = 10	N.A. = 8
Night:	Yes = 0	No = 7	N.A. = 9

4. (3.1.8) Were the C3I interface procedures between RPV and other units satisfactory?

Day:	Yes = 3	No = 5	N.A. = 10
Night:	Yes = 3	No = 0	N.A. = 13

5. (3.1.8) Were the COMSEC procedures between RPV and other units satisfactory?

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 4	No = 1	N.A. = 11

6. (3.1.10) Do you know of situations during testing where missions were not flown within 30 minutes of the time indicated on the Mission Order?

Day:	Yes = 15	No = 1	N.A. = 2
Night:	Yes = 8	No = 2	N.A. = 6

7. (3.1.10) Are you aware of the procedures for setting priorities for RPV support?

Day:	Yes = 4	No = 9	N.A. = 5
Night:	Yes = 3	No = 7	N.A. = 6

8. (3.1.14) Were problems encountered planning AV flights to accomplish the tasks outlined on the Mission Orders?

Day:	Yes = 1	No = 2	N.A. = 15
Night:	Yes = 4	No = 3	N.A. = 9

9. (3.1.16) Were any problems encountered during mission planning while wearing MOPP II gear?

Day:	Yes = 1	No = 8	N.A. = 9
Night:	Yes = 0	No = 12	N.A. = 4

10. (3.1.16) Were any problems encountered during mission planning while wearing MOPP IV gear?

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 1	No = 9	N.A. = 6

11. (3.4.6) Did jamming during coordination for launch and handoff operations have an adverse effect on these operations?

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 2	No = 5	N.A. = 9

12. (3.4.8 & 3.4.9) Overall, were jamming countermeasures effective?

Day:	Yes = 5	No = 4	N.A. = 9
Night:	Yes = 3	No = 2	N.A. = 11

13. (3.4.9) Did FM and data link jamming adversely affect the ability of personnel to accomplish their mission?

Day:	Yes = 1	No = 8	N.A. = 9
Night:	Yes = 2	No = 2	N.A. = 12

14. (3.3.9) Was the communication compatibility between GCS and TACFIRE/BCS acceptable? Communication includes the following elements: (a) FM digital; (b) FM communications links; (c) supporting communications; (d) COMSEC; and (e) operating procedures.

Day:	Yes = 7	No = 2	N.A. = 9
Night:	Yes = 5	No = 0	N.A. = 11

15. (3.3.12) Were GCS-computed burst corrections accurate?

Day:	Yes = 9	No = 0	N.A. = 9
Night:	Yes = 2	No = 0	N.A. = 14

16. (3.3.12) Were GCS-computed burst corrections effective?

Day:	Yes = 9	No = 0	N.A. = 9
Night:	Yes = 2	No = 0	N.A. = 14

17. (3.3.15) Was the target engagement guidance provided by the supported unit adequate to accomplish your mission?

Day:	Yes = 6	No = 1	N.A. = 11
Night:	Yes = 3	No = 0	N.A. = 13

18. (3.3.18) Were the coordination and adjustment procedures used to conduct fire missions adequate?

Day:	Yes = 10	No = 0	N.A. = 8
Night:	Yes = 2	No = 0	N.A. = 14

19. (3.3.20) Did the autotracker perform adequately during conduct of fire missions?

Day:	Yes = 10	No = 0	N.A. = 8
Night:	Yes = 3	No = 0	N.A. = 13

20. Were recovery procedures used for the test adequate for successful mission performance?

Day:	Yes = 11	No = 1	N.A. = 6
Night:	Yes = 10	No = 1	N.A. = 5

21. (3.1.20) Was it easy to enter information from the mission planning worksheet into the GCS computer in terms of adequacy of disk storage, computer rejection of illegal inputs, or computer failure to reject illegal inputs?

Day:	Yes = 5	No = 0	N.A. = 13
Night:	Yes = 4	No = 0	N.A. = 12

22. (3.1.22) Were the mission planning procedures adequate, including CLRS/FCS coordination?

Day:	Yes = 5	No = 0	N.A. = 13
Night:	Yes = 6	No = 0	N.A. = 10

23. Were the FCS/CLRS coordination procedures for AV Launch and Handoff adequate?

Day:	Yes = 10	No = 0	N.A. = 8
Night:	Yes = 6	No = 1	N.A. = 9

24. (3.1.29 & 3.1.39) Was the FM communication between FCS and CLRS adequate for handoff procedures?

Day:	Yes = 11	No = 0	N.A. = 7
Night:	Yes = 5	No = 0	N.A. = 11

25. (3.1.47) Generally, did lost links make the remainder of the AV sortie ineffective?

Day:	Yes = 2	No = 9	N.A. = 7
Night:	Yes = 7	No = 1	N.A. = 8

26. (3.1.50) Generally, were the procedures used to overcome emergency in-flight problems such as lost link adequate?

Day:	Yes = 11	No = 0	N.A. = 7
Night:	Yes = 6	No = 1	N.A. = 9

27. Generally, was the intelligence received as a result of the AV sorties useful and timely?

Day:	Yes = 8	No = 0	N.A. = 10
Night:	Yes = 5	No = 0	N.A. = 11

28. (3.1.53) Is the current doctrine/procedures for transmission (reporting) of intelligence during and after AV sorties adequate?

Day:	Yes = 6	No = 1	N.A. = 11
Night:	Yes = 2	No = 0	N.A. = 14

29. (3.1.54) Did illegal inputs (excessive climb, dive, turn, and speed rates) harm the rest of the AV flight program?

Day:	Yes = 2	No = 6	N.A. = 10
Night:	Yes = 1	No = 1	N.A. = 14

30. Does the RPV have adequate ability to measure ground truth?

Day:	Yes = 8	No = 1	N.A. = 9
Night:	Yes = 3	No = 1	N.A. = 12

31. (3.4.14) Did communications problems exist which adversely affected command and control?

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 2	No = 5	N.A. = 9

32. (3.4.15) Were personnel able to effectively perform command and control communications functions in MOPP 2 gear?

Day:	Yes = 13	No = 0	N.A. = 5
Night:	Yes = 11	No = 0	N.A. = 5

33. (3.4.15) Were personnel able to effectively perform command and control communications functions in MOPP 4 gear?

Day:	Yes = 7	No = 6	N.A. = 5
Night:	Yes = 7	No = 1	N.A. = 8

34. (3.4.38) Can RPV personnel effectively perform emplacement and displacement duties in NBC gear (i.e., MOPP 2 or 4)?

Day:	Yes = 16	No = 2	N.A. = 0
Night:	Yes = 13	No = 1	N.A. = 2

35. (3.4.39) Were there any problems associated with camouflaging the different RPV vehicles or equipment?

Day:	Yes = 6	No = 11	N.A. = 1
Night:	Yes = 2	No = 14	N.A. = 0

36. (3.4.40) Were battery/section command and control, reconnaissance, selection and occupation procedures adequate?

Day:	Yes = 10	No = 1	N.A. = 7
Night:	Yes = 10	No = 1	N.A. = 5

37. Were decontamination procedures able to be accomplished in accordance with FM 3-87 and established tactical SOPs?

Day:	Yes = 6	No = 2	N.A. = 10
Night:	Yes = 3	No = 2	N.A. = 11

38. (3.4.46) Were air defense electro-optical devices able to acquire and track the AV during flight?

Day:	Yes = 2	No = 0	N.A. = 16
Night:	Yes = 2	No = 1	N.A. = 13

39. (3.4.47) Did the modular collective protective equipment (MCPE) function adequately?

Day:	Yes = 0	No = 1	N.A. = 17
Night:	Yes = 2	No = 1	N.A. = 13

40. (3.4.48) Were any problems experienced with decontaminating battery equipment?

Day:	Yes = 0	No = 7	N.A. = 11
Night:	Yes = 0	No = 7	N.A. = 9

41. (3.4.49) Is it easy to camouflage or to conceal RPV vehicles visual signatures?

Day:	Yes = 10	No = 6	N.A. = 2
Night:	Yes = 13	No = 1	N.A. = 2

42. Are the RPV vehicles and equipment vulnerable to small arms and indirect fire weapons?

Day:	Yes = 11	No = 1	N.A. = 6
Night:	Yes = 10	No = 2	N.A. = 4

43. Can the RPV vehicles and equipment be decontaminated with organic and support decontamination equipment?

Day:	Yes = 7	No = 0	N.A. = 11
Night:	Yes = 8	No = 1	N.A. = 7

44. (3.4.72) Were adequate alternative diagnostic procedures available when BITE/TMDE was not available?

Day:	Yes = 4	No = 1	N.A. = 13
Night:	Yes = 7	No = 1	N.A. = 8

45. (3.4.74) Is the MAC effective in its present form?

Day:	Yes = 6	No = 1	N.A. = 11
Night:	Yes = 5	No = 1	N.A. = 10

46. (3.4.81) Overall, is the logistics support concept for RPV adequate?

Day:	Yes = 4	No = 5	N.A. = 9
Night:	Yes = 10	No = 1	N.A. = 5

47. (3.4.82) Is the Systems Support Package adequate as tested?

Day:	Yes = 3	No = 2	N.A. = 13
Night:	Yes = 6	No = 0	N.A. = 10

48. (3.4.84) Are POL and maintenance recovery capabilities adequate for mission performance?

Day:	Yes = 8	No = 4	N.A. = 6
Night:	Yes = 10	No = 5	N.A. = 1

49. (3.4.73) Were the maintenance authorizations and organizations adequate?

Day:	Yes = 3	No = 7	N.A. = 8
Night:	Yes = 10	No = 5	N.A. = 1

50. (3.4.84) Is the battery able to coordinate and obtain all needed supplies for widely separated RPV sections during field deployment?

Day:	Yes = 6	No = 3	N.A. = 9
Night:	Yes = 10	No = 5	N.A. = 1

51. (3.4.87) Is the current assignment strategy of supply and maintenance personnel adequate for effective mission performance?

Day:	Yes = 3	No = 4	N.A. = 11
Night:	Yes = 6	No = 7	N.A. = 3

52. Are common and special tools supplied with RPV equipment adequate for effective mission performance?

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 12	No = 4	N.A. = 0

53. Is TMDE and Calibration equipment for RPV adequate?

Day:	Yes = 4	No = 5	N.A. = 9
Night:	Yes = 7	No = 1	N.A. = 8

54. (3.4.75 & 3.4.88) Do the TMs have adequate logistics support procedures documentation?

Day:	Yes = 3	No = 8	N.A. = 7
Night:	Yes = 7	No = 5	N.A. = 4

55. (3.4.80) Overall, are RPV parts easy to remove, repair and replace?

Day:	Yes = 11	No = 1	N.A. = 6
Night:	Yes = 11	No = 3	N.A. = 2

56. (3.4.84) In the proposed RPV system, are all classes of supply available at the proper echelons?

Day:	Yes = 5	No = 2	N.A. = 11
Night:	Yes = 8	No = 3	N.A. = 5

57. Were the training aids used during RPV training adequate?

Day:	Yes = 6	No = 4	N.A. = 8
Night:	Yes = 5	No = 1	N.A. = 10

58. Were the training devices used during RPV training adequate?

Day:	Yes = 5	No = 2	N.A. = 11
Night:	Yes = 5	No = 2	N.A. = 9

59. IN your opinion, are there any environmental aspects such as illumination, noise, ventilation, temperature, vibration, and climate that pose a potential problem for RPV operators?

Day:	Yes = 13	No = 2	N.A. = 3
Night:	Yes = 6	No = 6	N.A. = 4

60. Is the information in the RPV Technical Manuals presented clearly?

Day:	Yes = 5	No = 7	N.A. = 6
Night:	Yes = 9	No = 3	N.A. = 4

61. Is it easy to look up or locate information related to a specific problem in the technical manual (TM)?

Day:	Yes = 7	No = 2	N.A. = 9
Night:	Yes = 12	No = 2	N.A. = 2

62. Is the TM sufficiently small and rugged that it can be carried and stowed under operational conditions with a minimum of difficulty or damage (lost pages, etc.)?

Day:	Yes = 3	No = 11	N.A. = 4
Night:	Yes = 10	No = 4	N.A. = 2

63. Do you feel there should be more classroom training?

Day:	Yes = 7	No = 4	N.A. = 7
Night:	Yes = 7	No = 7	N.A. = 2

64. Do you feel there should be more collective (unit) training?

Day:	Yes = 7	No = 7	N.A. = 4
Night:	Yes = 7	No = 7	N.A. = 2

65. (3.4.91) Have you observed any other training problems which you feel are important?

Day:	Yes = 6	No = 6	N.A. = 6
Night:	Yes = 3	No = 11	N.A. = 2

66. Were the Skill Performance Aids effective in assisting successful task performance?

Day:	Yes = 4	No = 2	N.A. = 12
Night:	Yes = 7	No = 2	N.A. = 7

67. (3.4.92) IN your opinion, can 90% of the soldiers perform 90% of the RPV related SQT tasks?

Day:	Yes = 7	No = 5	N.A. = 6
Night:	Yes = 6	No = 4	N.A. = 6

68. (3.4.97) Have you or others identified critical tasks that were not included in training?

Day:	Yes = 2	No = 10	N.A. = 6
Night:	Yes = 2	No = 10	N.A. = 4

69. Are there ARTEP tasks that the battery is unable to perform to standards?

Day:	Yes = 2	No = 5	N.A. = 11
Night:	Yes = 4	No = 5	N.A. = 7

70. Are there any other individual or collective performance deficiencies that were not corrected by additional training and/or experience?

Day:	Yes = 0	No = 8	N.A. = 10
Night:	Yes = 0	No = 11	N.A. = 5

71. (3.4.104) Have you observed or are you aware of ARTEP tasks degraded or not completed in a training environment due to safety or health considerations related to the operations of RPV vehicles and equipment?

Day:	Yes = 0	No = 7	N.A. = 11
Night:	Yes = 0	No = 9	N.A. = 7

SAFETY

Have you or others observed potential or actual safety hazards that could result in shock, burns, falls, cuts, bruises, explosions, entanglements in moving parts, strains due to lifting or handling, or other injuries? Please consider all situations when the equipment will be operated: at night; with MOPP gear; in rain or snow; in heat, etc. Also, consider all aspects of the equipments' operation: movement from site to site; site setup; preparation for mission; actual mission operation, and site breakdown.

Please answer for each equipment component.

GCS

72. Air Vehicle Console

Day:	Yes = 1	No = 16	N.A. = 1
Night:	Yes = 0	No = 9	N.A. = 7

73. Mission Payload Console

Day:	Yes = 1	No = 15	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

74. Mission Commander Console

Day:	Yes = 1	No = 15	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

75. Mission Planning Facility

Day:	Yes = 1	No = 15	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

76. Computer Suite

Day:	Yes = 1	No = 15	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

77. Communications Panels

Day:	Yes = 1	No = 15	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

78. Modular Collective Protection Equipment

Day:	Yes = 2	No = 11	N.A. = 5
Night:	Yes = 0	No = 8	N.A. = 8

79. Power Supply Panels

Day:	Yes = 2	No = 14	N.A. = 2
Night:	Yes = 1	No = 8	N.A. = 7

80. Ground Support Equipment

Day:	Yes = 5	No = 11	N.A. = 2
Night:	Yes = 0	No = 9	N.A. = 7

MAINTENANCE SHELTER

81. Power Panels

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

82. AV Wing Storage Rack

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

83. MS Hoist Assembly

Day:	Yes = 2	No = 5	N.A. = 11
Night:	Yes = 1	No = 5	N.A. = 10

84. Air Vehicle Fault Isolator

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

85. Internal Power Board

Day:	Yes = 1	No = 7	N.A. = 10
Night:	Yes = 0	No = 6	N.A. = 10

86. Work Bench

Day:	Yes = 1	No = 8	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

87. Tools

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

88. Storage

Day:	Yes = 2	No = 7	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

89. AV Workstand

Day:	Yes = 3	No = 6	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

90. Ground Support Equipment

Day:	Yes = 3	No = 6	N.A. = 9
Night:	Yes = 1	No = 5	N.A. = 10

91. Universal Support Stand

Day:	Yes = 3	No = 6	N.A. = 9
Night:	Yes = 0	No = 6	N.A. = 10

AIR VEHICLE MOBILE CRANE

92. AV Container

Day:	Yes = 3	No = 6	N.A. = 9
Night:	Yes = 0	No = 7	N.A. = 9

93. AV Fuel Servicing Unit

Day:	Yes = 7	No = 5	N.A. = 6
Night:	Yes = 3	No = 4	N.A. = 9

94. Boarding Ladders

Day:	Yes = 5	No = 7	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

95. AV Crane

Day:	Yes = 5	No = 7	N.A. = 6
Night:	Yes = 2	No = 5	N.A. = 9

96. AV Recovery Harness

Day:	Yes = 3	No = 9	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

97. AV Hoisting Fixture

Day:	Yes = 3	No = 9	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): FSU operation exposes 3 to 4 individuals to fire hazard. Problems with leakage. Leaks in AV fuel servicing unit,

ladders not used, crane handlers not observing personnel on ground. Boarding ladders are slippery when wet. Extreme care has to be used when working with the equipment. 92 through 97 are probable candidates under good conditions start adding MOPP gear & other degradations, then you lessen the probability and increase the possibilities.

Comments (Night): This equipment when used properly has no problems. The FSU needs to be more sturdy. The hoisting fixture needs to be approximately 18 inches longer. When moving an AV container from one vehicle to another, at least one person must "push" the container into the other vehicle.

LAUNCHER

98. AV Starter

Day:	Yes = 4	No = 8	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

99. Shuttle

Day:	Yes = 8	No = 4	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): Saw several persons hurt (Eddy, Engvig)

100. Guide Rail Assembly

Day:	Yes = 6	No = 6	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

101. AV Loader

Day:	Yes = 4	No = 8	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

102. Railfold Actuator

Day:	Yes = 4	No = 8	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

103. Power Panels

Day:	Yes = 2	No = 10	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

104. Hydraulic System

Day:	Yes = 4	No = 8	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): Micro switches on shuttle caused cuts on fingers. Hearing (noise). Same as comments above: Extreme care has to be

used when working with the equipment. Hydraulic pressure can "kill" and/or maim. Same as 92-97: 98-104 are probable candidates under good conditions start adding MOPP gear and other degradations, then you lessen the probabilities and increase the possibilities.

RECOVERY VEHICLE

105. Recovery Net

Day:	Yes = 2	No = 9	N.A. = 7
Night:	Yes = 0	No = 7	N.A. = 9

106. Net Support Structure

Day:	Yes = 5	No = 6	N.A. = 7
Night:	Yes = 1	No = 6	N.A. = 9

107. Decelerator

Day:	Yes = 3	No = 6	N.A. = 9
Night:	Yes = 0	No = 7	N.A. = 9

108. Operator Stand

Day:	Yes = 5	No = 6	N.A. = 7
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): Operator didn't use safety chain at all.

109. Power Distribution

Day:	Yes = 3	No = 7	N.A. = 8
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): Ballistic shield cover fell off elevation camera, just missing operator on stand. Same as above: Extreme care has to be used when working with the equipment, weight of the equipment is a factor. Same as 92-97: 105-109 are probable candidates under good conditions start adding MOPP gear and other degradations, then you lessen the probabilities and increase the possibilities.

Comments (Night): Cables holding net are often tangled and catch on anything while setting up. Sometimes the guide wires broke during recovery.

AIR VEHICLE

110. Engine

Day:	Yes = 3	No = 9	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

111. Fuel System

Day:	Yes = 4	No = 8	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): AV sprays fuel upon launch onto launch operator.

112. Electrical System

Day:	Yes = 2	No = 10	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

113. Mission Payload

Day:	Yes = 3	No = 9	N.A. = 6
Night:	Yes = 0	No = 7	N.A. = 9

Comments (Day): Prop disintegration can be hazardous to launcher operators. AV fuel system leaks out the drain tube while on the launcher prior to launch. M payload is heavy and awkward to handle.

Comments (Night): The payload had to be changed.

REMOTE GROUND TERMINAL

114. Antenna

Day:	Yes = 5	No = 6	N.A. = 7
Night:	Yes = 1	No = 7	N.A. = 8

115. Batteries

Day:	Yes = 4	No = 7	N.A. = 7
Night:	Yes = 0	No = 8	N.A. = 8

116. Power Panels

Day:	Yes = 4	No = 7	N.A. = 7
Night:	Yes = 0	No = 8	N.A. = 8

117. Control Panels

Day:	Yes = 5	No = 6	N.A. = 7
Night:	Yes = 0	No = 8	N.A. = 8

118. Power Generator

Day:	Yes = 6	No = 5	N.A. = 7
Night:	Yes = 1	No = 7	N.A. = 8

Comments (Day): The prescribed procedures that are written in the manuals have to be followed. If not it could cause serious bodily injury. The cover for the RGT should be of more durable material than the flimsy plastic used now.

In your opinion, are the operators and/or maintainers SQT qualified on the RPV equipment? If there was an SQT test on each of the following portions of the RPV battery, could the operators and/or maintainers that participated in the field test pass an SQT?

Answer for each component.

GCS

119. Air Vehicle Console

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 5	No = 1	N.A. = 10

120. Mission Payload Console

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 6	No = 0	N.A. = 10

121. Mission Commander Console

Day:	Yes = 8	No = 4	N.A. = 6
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): Only 4 originally school trained.

122. Mission Planning Facility

Day:	Yes = 7	No = 5	N.A. = 6
Night:	Yes = 5	No = 1	N.A. = 10

123. Computer Suite

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 5	No = 1	N.A. = 10

124. Communications Panels

Day:	Yes = 8	No = 4	N.A. = 6
Night:	Yes = 6	No = 0	N.A. = 10

125. Modular Collective Protection Equipment

Day:	Yes = 5	No = 6	N.A. = 7
Night:	Yes = 5	No = 1	N.A. = 10

Comments (Day): Not all were school trained.

126. Power Supply Panels

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 6	No = 0	N.A. = 10

127. Ground Support Equipment

Day:	Yes = 9	No = 3	N.A. = 6
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): M planning was continuously done with basic format retained in the computer memory. When mission planning was done from scratch, it appeared that there was much confusion. Problems still exist with the com panels that have been circumvented. Personnel very good. The modular collective protection equipment was not used and has not been operational. Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

MAINTENANCE SHELTER

128. Power Panels

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

129. AV Wing Storage Rack

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

130. MS Hoist Assembly

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

131. Air Vehicle Fault Isolator

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

132. Internal Power Board

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

133. AV Workstand

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

134. Ground Support Equipment

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 5	No = 0	N.A. = 11

135. Universal Support Stand

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 4	No = 0	N.A. = 12

Comments (Day): Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

AIR VEHICLE MOBILE CRANE

136. AV Fuel Servicing Unit

Day:	Yes = 9	No = 2	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

137. AV Crane

Day:	Yes = 8	No = 3	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

138. AV Recovery Harness

Day:	Yes = 9	No = 2	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

139. AV Hoisting Fixture

Day:	Yes = 9	No = 2	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): While using crane, individuals would neglect staying from underneath suspended loads. Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

LAUNCHER

140. AV Starter

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

141. Shuttle

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

142. Guide Rail Assembly

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

143. AV Loader

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

144. Power Panels

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

145. Hydraulic System

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

RECOVERY VEHICLE

146. Recovery Net

Day:	Yes = 8	No = 1	N.A. = 9
Night:	Yes = 6	No = 0	N.A. = 10

147. Decelerator

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

148. Power Distribution

Day:	Yes = 8	No = 2	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

AIR VEHICLE

149. Engine

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

150. Fuel System

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

151. Electrical System

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

152. Mission Payload

Day:	Yes = 7	No = 3	N.A. = 8
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up.

Comments (Night): The payload changed out too many times; something about mission payload

REMOTE GROUND TERMINAL

153. Antenna

Day:	Yes = 8	No = 3	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

154. Power Panels

Day:	Yes = 8	No = 3	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

155. Control Panels

Day:	Yes = 8	No = 3	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

156. Power Generator

Day:	Yes = 8	No = 3	N.A. = 7
Night:	Yes = 6	No = 0	N.A. = 10

Comments (Day): Same as above: Other than the training received at Ft. Sill, the operators have not been cross trained to keep their proficiency up. Everyone worked well as a team 8 on the FCS and each individual appeared to operate the equipment competently and confidently.